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Massachusetts Medical Society.

MEETING OF THE SECTION OF MEDICINE, JUNE 6, 1916.

PAPERS ON DIABETES MELLITUS, WITH THE DISCUSSION.

RESULTS OBTAINED IN THE TREATMENT OF DIABETES MELLITUS.

MAY 1, 1915-MAY 1, 1916.

BY ELLIOTT P. JOSLIN, M.D., BOSTON.

IN a paper read one year ago at Washington the results obtained in a series of cases of diabetes, coming under my observation for the year ending May 1, 1915, were reported, and in a subsequent paper in New York last December I brought together the results of treatment of all the cases I had seen up to that time. The former paper contained a note of hopefulness so unusual for an article on diabetes and the latter gave such specific explanation of avoidable causes of death in diabetes that now, when periods of one year and of six months have intervened, it is pertinent to inquire whether these new hopes and explanations were justified.

The comparatively short interval of time which has elapsed is by no means a bar to a correct answer, for the course of diabetes in the past unfortunately has been short, and the prolongation of life by six months to one year would signify the gain of 10 to 30% in the duration of the disease. For, speaking roughly, the average duration of life of 408 of my fatal cases has been five years, and that of 490 of my living cases has already reached six years.

During the year ending May 1, 1915, 211 cases of diabetes came under my observation, and of this number 31, or 15%, died; during the subsequent year 314 cases were seen, and so far as I am aware, 37, or 11.7%, have died. If, for the sake of accuracy, I omit 6 cases from this number of whom I have no positive information during the five months prior to May 1, the percentage mortality is 12%, which represents a decrease in mortality over the previous year of about 20%.

TABLE I.—A COMPARISON OF THE MORTALITY OF DIABETIC CASES IN TWO SUCCESSIVE YEARS.

Periods of Observation.	Total.	Traced.	Dead. No.	Dead. Per Cent
May 1, 1914, to May 1, 1915	211	211	31	14.7
May 1, 1915, to May 1, 1916	314	308	37	12.0

These figures are encouraging, but they become still more so when I add that a study of the 37 fatal cases seen this last year shows that death might have been deferred in about one-half of these if the methods of treatment now in general use had been adopted.

The statistics above given are personal statistics, and therefore it appeared of interest to examine those of the State of Massachusetts, and this has been accomplished, thanks to the hearty coöperation of the Board of Health. Obviously, such compilations are less accurate; indeed, frequently the duration of the disease is not given on the death certificate. However, for the sake of comparison I have arranged these data along with my own by decades according to the age of the individual at the onset of the disease.

Table II.—Duration of Fatal Cases of Diabetes in Massachusetts for 1915 Compared with Author's Total Fatal Cases.

	Massachusetts.		Joslin.	
Decades.	No. of Cases.	Yrs. Duration.	No. of Cases.	Yrs. Duration.
0-10	17	0.79	33	2.39
11-20	22	1.77	50	2.62
21-30	25	1,21	41	5.28
31-40	41	4.16	55	6.82
41-50	59	5.36	83	6.87
51-60	77	4.82	108	6.46
61-70	86	3.83	56	5.47
71-80	34	2.01	16	5.06
81-90	6	1.11	1	0.83

It will be seen that the greatest difference in mortality between the statistics of the state and my own lies in the early decades. And a further startling difference, not obvious in this table, lies in the number of cases in each group who succumbed during the first year to the disease. This is best illustrated by another table, which is of special interest because it includes the data of the Massachusetts General Hospital for two different periods. In it I have also included statistics given by Naunyn for his own practice.

Table III.—The Fatality of Diabetes Mellitus During the First Year of the Disease.

Sources of Statistics.	Number of Cases.	Percentage of Total Fatal Cases Dying First Year.
Massachusetts 1915*	370	27.9
Boston 1915†	117	27.3
Massachusetts General Hospital		
1824-1898	47	67.5
1898-1913	69	40.6
Naunyn	66	30.0
Joslin	408	16.9

It may not be out of place to add that of 490 cases of diabetes on my list, 94% have already passed the first year of the disease,—the danger-zone of the diabetic.

In a study of the causes of death of 408 cases of my series, it was found that two out of every three (66%) died of coma, that 87% of all those who succumbed during the first year of the disease died of coma, and that this was the case in 100% of the fatal cases in children. Therefore, if the mortality of diabetes is to be reduced, our energies should be directed first toward the avoidance of coma, because the treatment of coma is so unsatisfactory; and, second, particular attention should be exercised in the management of cases of diabetes in the first year following the detection of the disease. Furthermore, all cases should be persistently followed up, and the good effects of treatment not be allowed to lapse by indifference or neglect.

Fatal Cases.

May 1, 1915, to May 1, 1916.

Cause of Dealth.	New Cases.	Case. Nos.	Old. Cases.	Case. Nos.
Coma (within 24 hrs.)	3	(1004, 865 893)		
Coma (broke treatment)	4	(927, 740, 901, 868)		
Coma (died within 24 hrs., suppression urine)	1	(1015)		
Coma	4	(906—not seen since diabetes developed; 909, 887, 937)	7	(723, 181, 269, 530, 363, 813, 733)
Cardiac	1	(929)	1	(848)
Cardio-renal	1	(859)		
Thyroid	1	(869)		
Gangrene	2	(900, 1010)		
Operation on prostate or bladder drained	3	(939, 1042, 1019)		
Tuberculosis	2	(861, 862)		
Cancer			1	(474)
Appendicitis			1	(753)
Carbuncle			1	(513)
Pneumonia			1	(527)
Angina pectoris			1	(355)
Unknown			2	(823, 582)
Total	22		15	

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* The total number of fatal cases of diabetes mellitus in Massachusetts for 1915 was 648, but of this number the duration is recorded as less than one day in two, and not recorded at all in 278, thus leaving only 370 available for statistics; only 367 were used in Table II, three cases with duration of 22, 29 and 51 years being omitted in first three decades.

† The total number of fatal cases of diabetes in Boston for 1915 was 191, but the duration is not recorded in 74, thus leaving 117 available for statistics.

DEFINITION AND DETECTION OF ACIDOSIS IN DIABETES MELLITUS.

By Albert A. Hornor, M.D. Boston.

[From the Clinic of Elliott P. Joslin, M.D.]

Since Kussmaul described the deep breathing and coma of diabetic patients approaching death, and acetone diacetic acid and B. oxybutyric acid were associated with this condition by Petters, Gerhardt, ~~and Minkowski~~, and an increase of the elimination of ammonia was pointed out by Stadelman, this state has been termed by Naunyn one of acid poisoning or acidosis.

By observation of the patient, it is easy to note the drowsiness, exaggerated respiration, and dry skin, so characteristic of the diabetic about to die in coma. So seldom does a patient recover and so temporary are the few recoveries recorded that it is manifestly necessary for us to recognize precomatose conditions if we would save our patients.

Consider the demonstrable differences between the metabolism of a comatose diabetic and the metabolism of a healthy individual. Until recently these were limited to the changes demonstrable in the urine. Of late, however, changes in the blood and in the expired air have been recognized. The changes in the urine are the excretion of glucose and increased quantities of diacetic and B. oxybutyric acid and ammonia. The changes in the blood are a reduced amount of carbon dioxide and an increased amount of acetone bodies; the change in the expired air consists in a reduced percentage of carbon dioxide. The reason for this will be discussed later.

Among diabetics who are exhibiting no undesirable condition, one finds the condition of the urine essentially normal; in other words, an absence of glycosuria and no increased excretion of acetoacetic acid, B. oxybutyric acid or ammonia. Prior to the development of acidosis by a diabetic, there will always be a recurrence of glycosuria. Further, in none of the cases on which this study is based has there been any evidence of extreme acidosis where the amount of glucose excreted in the urine was less than the amount of carbohydrate ingested in the corresponding twenty-four hours; in other words, no extreme acidosis in the presence of a positive carbohydrate balance.

After the occurrence of glycosuria, there may quickly follow an increased urinary excretion of acetone bodies. This can usually be detected qualitatively and roughly estimated quantitatively by the addition of a few drops of a strong solution of ferric chloride (the Gerhardt test for diacetic acid, familiar to you all). It happens in rare instances, however, that a patient presents all other symptoms of diabetic coma without showing any marked ferric chloride reaction in the urine. In such instances, the presence of abnormal quantities of acid bodies may be inferred by the demonstration of an increase in the urinary ammonia, a part of the urea nitrogen being converted to ammonia, so that the acetone bodies may be excreted as salts of ammonia. In acidosis, the urinary ammonia may rise from the normal, 0.75 gr. in twenty-four hours, to 7.5 gm. or even more in twenty-four hours. At the same time, there is a change in the ammonia-nitrogen ratio of 1:12 to 1:3, or in extreme cases even 1:2. Consequently, if a twenty-four hour amount of urine be not available, one may estimate the degree of acidosis by determining urinary ammonia and urinary nitrogen and their ratio in a single specimen of urine. This, of course, involves the apparatus and ability to determine urinary nitrogen. The ammonia-nitrogen ratio serves as an index of acidosis save when alkali, for example, sodium bicarbonate, is being administered, under which condition some of the acetone bodies may be excreted in combination with the alkali administered. The determination of urinary ammonia may be done satisfactorily either by the method of Folin[1] or that of Malfatti.[2] The simpler, though less accurate, method of Malfatti (as described in the more recent text-books on physiological chemistry) is probably better adapted to the use of the general practitioner than that of Folin, involving, as it does, only the mixture of urine with potassium oxalate and a titration with formalin. Actual quantitation of acetone bodies in urine is best done by the Schaffer-Marriott method. This, however, requires more apparatus and time than is available, save in highly specialized laboratories.

As already stated, in acidosis there occurs a reduced percentage of carbon dioxide in the expired alveolar air, which is consequent to a reduced carbon dioxide tension in the blood. Before discussing this fact, however, it is probably best to say a few words about the mechanism through which it is affected. By the micro method for quantitating acetone bodies in blood, described by Marriott,[3] it has finally been shown that in certain, if not all, cases of diabetic coma, there is an increase in the quantity of acetone bodies in the blood. This, however, does not affect the reaction of the blood either by increasing acidity or, what would be the same thing, decreasing alkalinity, though all the acetone bodies are acid in character. The present conception of the wherefore of this fact is chiefly due to the work of Dr. Lawrence J. Henderson.[4] His studies have shown definitely that the relation of blood to neutrality is that of slight alkalinity, and varies only within extremely narrow limits, and is capable of accurate determination only by the use of electrochemical methods. The reaction of the blood is maintained by the large amount of weak acids and their salts in the blood,—carbon dioxide and sodium bicarbonate, monosodium phosphate and diosodium phosphate, and somewhat by the amphoteric acids from proteins. Carbonates and phosphates possess, so far as is known, the highest power to preserve neutrality in solution. Under normal, as well as under abnormal, conditions this is quite essential, for acid substances are continuously being poured into the blood in the course of normal metabolic processes. The maintenance of neutrality of the blood is further facilitated by excretion of volatile acids through the lungs, chiefly in the form of carbonic acids and the excretion of non-volatile acids through the kidneys, chiefly in combination with ammonia and other bases. Under normal conditions, the amount and kinds of acid poured into the blood by metabolic processes are such that the amount of carbonic acid present in the blood is practically constant. The acetone bodies in the blood of diabetics may be and frequently are in such great quantities that in order to maintain its constant relation to neutrality the blood must lower the normal tension of other acids. This is done by lowering the tension of carbonic acid. To do this, more carbon dioxide must be excreted through the lungs, inasmuch as carbon dioxide is excreted from blood capillaries until, and only until, the carbon dioxide tension and alveolar air is the same as that of the blood, it is necessary to increase lung ventilation. This has been shown to be regulated by the reaction of the blood. In other words, lung ventilation will keep carbon dioxide at a level necessary to maintain the normal reaction of the blood. It was reasoned, and later shown, that since carbon dioxide is excreted from blood into alveoli up to the point where the tension of carbon dioxide in alveoli equals the tension of carbon dioxide in blood, the estimation of carbon dioxide tension in expired alveolar air would furnish an estimate of the tension of carbon dioxide in blood and, consequently, an indirect estimate of quantity of acetone bodies in blood. Recently, Van Slyke, Stillman, and Cullen[5] of the Rockefeller Institute have devised a method of determining directly the carbon dioxide tension of the blood. Theirs is an admirable and accurate method and requires no coöperation on the part of the patient and, consequently, is suitable for use even in comatose patients. The method is easily learned, but requires considerable apparatus and more time than does the estimation of carbon dioxide tension in alveolar air, which has been found to run parallel, at least among diabetics.

For the determination of carbon dioxide in alveolar air many methods have been described. In 1914, Boothby and Peabody, after careful study of the various methods, recommended that of Plesch as modified by Higgins, the collection of sample being simple, but requiring considerable apparatus for analysis of gas collected. Quite recently Marriott[6] has described a method which is probably simpler than any other, when once the standard solutions have been prepared. The method employed in this work has been that described by Fridericia.[7] The method is simple, involves the use of inexpensive apparatus, which may be easily transported to the bedside, and the complete test requires less than fifteen minutes. The objection raised to this method is that it requires coöperation on the part of the patient. This is, of course, regrettable, but among diabetics who cannot coöperate, the clinical evidence of acidosis is so striking that an estimation of carbon dioxide tension would be desired only for academic reasons. On the other hand, observations made upon one comatose patient agreed with that obtained by direct determination of carbon dioxide tension in the blood.

The determination is made by collecting in a specially constructed U-shaped glass tube the last hundred cc. of a forced expiration after a normal inspiration, and then absorbing at room temperature the carbon dioxide in this 100 cc. of expired alveolar air with a strong alkali (20% potassium hydrate), thereby causing a partial vacuum, which is later replaced by water at room temperature and atmospheric pressure. (A detailed description of apparatus and method is appended.)

By a study of the carbon dioxide content of alveolar air it is found that normally the tension of carbon dioxide varies between 38 and 45 mm. of mercury. Among diabetics with slight acidosis, the carbon dioxide tension varies between 32 and 38 mm. of mercury; with moderate acidosis between 28 and 32 mm. of mercury; severe acidosis less than 25 mm. of mercury. Nineteen mm. of mercury is the lowest tension observed in a patient ultimately recovering from acidosis. Nine mm. of mercury is the lowest observed in this present study. That was in a comatose patient only a few hours ante mortem.

In an analysis of three hundred observations of carbon dioxide tension in alveolar air recently made upon cases from Dr. Joslin's Clinic, and reported by me at the Peter Bent Brigham Hospital, it was found that patients with carbon dioxide tension less than 25 mm. of mercury all had three grams or more urinary ammonia in twenty-four hours, and a negative carbohydrate balance. When the carbon dioxide tension varied between 25 and 33 mm. of mercury, urinary ammonia was between 3.7 gm. and 1.5 gm. in twenty-four hours, and in three-fourths of the cases the carbohydrate balance was positive. With carbon dioxide tension greater than 33 mm. of mercury, the urinary ammonia in twenty-four hours was less than 2 gm. The carbohydrate balance was usually positive and always so when the carbon dioxide tension was above 36 mm. of mercury. Ferric chloride reaction varies from negative to strongly positive at 36 mm. tension and also at 23 mm. tension, and, consequently, must be a very rough index of the degree of acidosis.

With the determination of the so-called alkali tolerance as an index of acidosis by the administration of sodium bicarbonate until the urine becomes alkaline, I have had no experience. This has been due chiefly to the fact that this study has been made entirely within the past year, and that now some of us are in doubt as to whether administration of alkali may not do harm. Consequently, it has not been deemed right to attempt a study of this sort from a purely analytical standpoint.

In conclusion, therefore, the acidosis of diabetes mellitus, aside from its clinical picture of exaggerated respiration, drowsiness and rapid pulse, may be defined as a condition in which the carbon dioxide tension in the blood and, consequently, in the alveolar air is reduced; the acetone bodies in the blood and urine are increased and associated with this is a rise in the excretion of ammonia; glycosuria is marked, and, saving exceptional cases, toward the end of prolonged coma, the carbohydrate balance is markedly negative. All these factors are important in determining the degree of acidosis, and, where time and facilities permit, should be ascertained. The detection of glycosuria, the demonstration of a positive ferric chloride reaction, and the determination of a diminution in the alveolar carbon dioxide tension are the procedures suitable for bedside use. The carbohydrate balance is also a valuable indication and one surely to be determined, but, unfortunately, it must always furnish information in part, at least, a day late.

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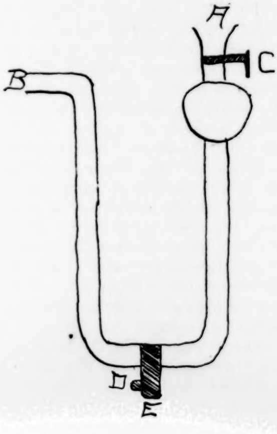
[1] Folin: Amer. Jour. Physiology, 1905, Vol. xiii, p. 75.
[2] Malfatti: Zeit. Anal. Chem., 1908, Vol. xxvii, p. 213.
[3] Marriott: Jour. Biol. Chem., 1914, Vol. xviii, p. 507.
[4] Henderson: Science, 1913, Vol. xxxvii, p. 389.
[5] Van Slyke, Stillman, Cullen: Proc. Soc. Exp. Biol. and Med., 1915, Vol. xii, p. 165.
[6] Marriott: Jour. Amer. Med. Asso., 1916, Vol. lxvi, p. 1594.
[7] Fridericia: Berlin. klin. Wochenschr., 1914, p. 1268.

APPENDIX.

Fridericia Method. This method possesses the advantage of being simple and involving the use of apparatus which may be easily transported to the bedside. One hundred cubic centimeters of alveolar air are collected in a closed chamber and then cooled from the temperature of the body to that of the room. The carbon dioxide in this air is then absorbed with a 20% aqueous solution of potassium hydrate, thereby creating a partial vacuum, which in turn is equalized with water. This water is then subjected to atmospheric pressure, when the amount of carbon dioxide replaced by water can be read in percentage of atmospheric air by reading the height in centimeters to which the column of water has risen in the closed 100 cc. chamber. This percentage may be changed to millimeters of mercury pressure by multiplying by the difference between barometric pressure at the time of the test, and this varies in Boston between 770 mm. and 750 mm., and the tension of aqueous vapor at 37.5° Centigrade, which is 48 mm. mercury. This will make a factor which lies between 718 and 702. As the reading of 760 is much the more common at sea level, for clinical purposes the factor 715 may be used satisfactorily. The patient should be in the same position and quiet for ten minutes prior to the performance of the test.



After a normal inspiration, the end, A, of the apparatus is inserted between the lips, and the patient is instructed to expire forcibly through the apparatus, with cocks C and D open, so that there is a free passage from A to B. The tube remains in the mouth throughout the entire expiration and the cock C is then closed, thus retaining between cocks C and D the last 100 cc. of expired air. (As the exchange of air in the upper respiratory passage is 200 cc. and the exchange of air from the alveoli is 800 cc., it is plain that with any care at all a sample of alveolar and not upper respiratory air will be obtained.) The apparatus is now immersed in a glass tank of water at room temperature and allowed to remain there five minutes. The best way to obtain water at room temperature is simply to keep the glass tank in the room with the patient for several hours before the test, though with an ordinary thermometer one can easily adjust the temperature of the water to that of the room. At the end of five minutes about 10 cc. of 20% aqueous solution of potassium hydrate is poured into the apparatus through the orifice B. A little of this potassium hydrate will leak through the hole in cock D to chamber CD. Now cock D is turned to the left so that chamber CD is closed and chamber BD is also closed. The small amount of potassium hydrate in chamber CD is shaken in the chamber for a moment. Then with apparatus in upright position, cock D is turned so that there is a continuous passage from C and B, and the amount of potassium hydrate which will run into the chamber CD is allowed to do so. Now cock D is turned to the left until BDE is a continuous passage, and in this way potassium hydrate is allowed to escape into the water tank. Chamber CD still contains 2 or 3 cc. of potassium hydrate solution and should be thoroughly washed with this solution. Every point in the surface of chamber CD must be touched by the alkaline solution. This is accomplished by shaking very thoroughly the potassium hydrate in chamber CD. The apparatus is again immersed in the tank of water. cock D is turned to the left until water rises into CD through EDC, and the apparatus left in the water five minutes. At the end of this time, the apparatus is raised until the bottom of the meniscus of the water in chamber CD is level with the top of the water in the tank. Now cock D is turned to the right until water runs through EDB to the level of water in chamber CD, which is now closed. Then cock D is turned further to the right until CDB is a continuous chamber. The apparatus is then again immersed to the bottom of the glass tank and the water in the arm BD of the apparatus should be at the same level with the water in the chamber CD and continuous with it. If this is not so, then the amount of water in BD should be changed until it reaches the height of the column of water in CD. The reading is now taken in centimeters of the height to which the column of water stands in CD, and this is so graduated as to represent the percentage of CO_2 which was absorbed by alkali and replaced by water. This completes the test.

The apparatus is prepared for the next test by opening cock C so that A to B is a continuous passage. The fluid in the apparatus is allowed to escape. Orifice B is put under the faucet and cold water allowed to run through the apparatus, taking care to shake sufficiently at the time so that water touches all of the inside of the apparatus. Repeat. Then pour through orifice B about 10 cc. of 4% solution boric acid. Rinse the apparatus very thoroughly with the acid so that there shall be no alkali remaining adherent to its sides. Wash again with cold water. Leave the apparatus so that orifices A and B are down, thereby allowing any water in the apparatus to drain out.

From the above it will be seen that the apparatus necessary is, first, the Fridericia appliance, a glass tank, whose depth is equal to the length of the Fridericia apparatus, a wash bottle containing 20% solution of potassium hydrate and another wash bottle containing 4% solution of boric acid. It is convenient to add an indicator, such as alizarin, or litmus, to the alkaline and acid fluids.

Observations on the Blood Sugar in Diabetes Mellitus.

By Orville F. Rogers, Jr., M.D., Boston.

[From the Medical Services of the Massachusetts General Hospital.]

The aim of this paper is to present some conclusions as to the value or necessity of determining the blood sugar in treating diabetes, either from a prognostic or therapeutic standpoint.

There have been in the past many methods for the estimation of blood sugar, but most of them have necessitated the use of such large quantities of blood that they were not practical for frequently repeated determinations, and therefore not suitable for clinical work. Another objection has been the complicated procedures involved, capable of being carried out only in a well equipped laboratory, and by a trained chemist. In the past few years there have been a number of methods brought forth which can be carried out on small samples of blood, notably the Bang micro-method,[1] in which the amount necessary is only a few drops, and the Lewis-Benedict method,[2] in which 2 cc. of blood are required. At the Massachusetts General Hospital we are using the Lewis-Benedict method * with a modification described by Myers and Bailey.[3] There are several other modifications in which only a few drops of blood are used, but the accuracy of these is rather doubtful.

The normal blood sugar varies between 0.06% and 0.11% according to the various authors. With the method that we use, the average is around 0.09% to 0.10%, and the high limit of normal about 0.11%. There are many factors that influence blood sugar besides diabetes. The sugar in the blood seems to be in a very labile state, and may be much influenced by a number of causes. Excitement, infections, the ingestion of food, and nephritis may all raise the blood sugar values above normal for a greater or smaller period of time, and to a greater or less degree. Lately the influence of damaged kidneys in raising the blood sugar in both normal and diabetic individuals has been emphasized more and more.

Diabetes is the most common cause of increased blood sugar and it also causes the highest values. Those rather rare cases of renal diabetes are the only ones in which there is not some elevation of the blood sugar while sugar is being excreted.

The blood sugar among those patients treated at the Massachusetts General Hospital who had diabetes but who had had no previous treatment, or whose treatment had not been efficient, that is, they were still excreting considerable sugar, was about 0.26% for an average, with variations from 0.76% to 0.16%. The highest value that was found (0.76%) was in a man in coma and the next highest was 0.36% in a very severe diabetic on the verge of coma. Values above 0.30% seem to be uncommon unless there is some difficulty on the part of the kidneys in accomplishing excretion.

On the other hand, the blood sugar determinations done on patients at the time they left the hospital, when they were sugar-free, and had been so generally for some days or weeks, showed variations from 0.07% to 0.18%, and averaged 0.12%. This is a decided drop in the blood sugar, but only six or seven of the values were actually within normal limits.

This brings up the question of the relation of glycaemia to glycosuria, and the permeability of the kidneys to sugar. The level of sugar in the blood does undoubtedly determine in a general way in normal or diabetic individuals, with normal kidneys, the presence or absence, or the amount, of glycosuria, but it is also true that the level which blood sugar must reach in order to cause a glycosuria of any given intensity varies greatly in different diabetics and in the same diabetic at different times. Recent work by Hamman and by Foster reported at Washington in May, 1916, seems to show that for normal individuals there is a fairly constant threshold for sugar excretion. However, for diabetics this threshold was more variable.

McLean,[4] Epstein,[5] and Myers and Bailey[3] have published papers tending to show a direct relationship between glycaemia and glycosuria, especially when there is no renal element, and

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* I wish to express my thanks to Dr. W. Denis and Miss Anna Minot, by whom almost all of the determinations have been done.

they have all emphasized the fact that where the kidneys are damaged, either by nephritis or in coma, this relationship is much disturbed and we may have freedom from glycosuria with a hyperglycaemia of considerable proportions, due to the raising of the threshold of sugar excretion. This, of course, can be determined only by estimations of the blood sugar, and it is in this type of case that we may get some information of practical value from the blood sugar determinations.

In persons in coma, excretion both of sugar and of acid bodies may be much interfered with, and in the severest cases the urine may not give a reaction for either of these substances, or the reactions may be very slight. The blood, on the other hand, may have very large amounts of these substances, and it is through blood examinations alone that a true picture of the condition may be arrived at. In other cases, when nephritis is present, the urinary excretion of sugar may be much diminished in proportion to the hyperglycaemia, and the latter may remain quite elevated after the glycosuria has ceased. Likewise in some diabetics with normal renal function, as measured by our usual tests, there is apparently a decreased permeability for sugar alone, giving rise to the same state of affairs.

The true influence of this persistent hyperglycaemia on the diabetic state is not definitely settled. If there is a sufficient excess of sugar circulating in the blood of a diabetic without nephritis to cause glycosuria, it is assumed that there is an overstrain on the pancreatic function, and that the latter will be thereby weakened. If nephritis is added to this, and the glycosuria thereby prevented, the hyperglycaemia persists as before. The question now is as to whether under these conditions the functional overstrain still continues to be placed upon the pancreas.

The answer from general grounds would appear to be "yes," but there are some things that argue against this. Allen,[6] by repeated injections of dextrose into a normal animal, sufficient to keep up a continuous glycosuria and hyperglycaemia for many months, was unable to produce diabetes; on the other hand, the animal's tolerance for dextrose became doubled, probably due to decreased permeability of the kidney for sugar. With animals, partially depancreatized, but not rendered diabetic, he was unable to produce true diabetes by means of these injections. The other argument against the evil effects of a persistent hyperglycaemia is based on clinical grounds, namely, that many patients who have had this condition while in the hospital have done very well in the out-patient department, though, to be sure, we do not know that their hyperglycaemia had not disappeared. In a great majority of the cases the treatment as carried out with the urinary sugar alone as a guide seems to be efficient in reducing the blood sugar to within a slight amount above normal, and the blood sugar determinations are not necessary as a guide.

From a prognostic standpoint it is not possible to predict from a patient's initial blood sugar level how long it will take him to become sugar free. Two parallel cases, each with a blood sugar of 0.26% on a mixed diet, entered within a week of each other recently. One had 6%, and the other 5%, sugar in the urine. One became sugar free after one and a half days of low diet, and the other required three days of low diet and three days of fasting to achieve the same result.

As to the height of tolerance as forecast by the blood sugar, there seems to be nothing more definite. The tolerance may be low when the initial blood sugar is low, or it may be high when the admission blood sugar is also very high. In the same way, the fact that the blood sugar reaches normal values after treatment does not necessarily mean that the case is mild, for there have been several cases treated in which the tolerance was quite low in spite of easy reduction of the blood sugar to normal. On the other hand, there have been cases with fairly high tolerance whose blood sugar showed a tendency to be quite elevated even after some weeks of treatment, and this without high blood pressure, albuminuria, low renal function (phthalein test), or casts. To be sure, most of the patients who showed this persistent hyperglycaemia had some evidence of renal trouble as revealed by one or more of the four criteria mentioned.

As has been pointed out before, we do not know definitely how much, if any, harm it does a patient to live with a continued hyperglycaemia, so until we do the value of blood sugar determinations as a prognostic aid seems doubtful. Even in cases without renal involvement there does not seem to be any definite correlation between either the initial or the final blood sugar and the tolerance, but in general the mild cases tend to sink to normal faster and more easily than the severe, though, as shown, there are many exceptions to the rule.

One point that should be borne in mind in relation to these determinations is that they must be done either with the patient fasting in the morning, or at least four or five hours after food, for the alimentary hyperglycaemia of diabetics is of considerable duration and extent.

Many writers have pointed out that blood sugar is in a very unstable state, and if only a single determination is done, a false picture of the condition may be obtained. It would undoubtedly be best to have daily determinations if one wished to follow the blood sugar accurately.

SUMMARY.

Diabetics have a higher blood sugar when they are excreting sugar in the urine than they do when the urine is rendered sugar-free.

Name.	Date.	Age.	Duration of Disease.	Per Cent. of Sugar in Urine.	Grams of Sugar in Urine.	Days Sugar-Free.	Grams of Carbohydrate in Diet, Previous 24 hours.	Per Cent. of Blood Sugar.	Days to Become Sugar-Free.	Tolerance for Carbohydrates in Grams.	Phenolsulphonephthalein. Per Cent. Excreted in 2 hrs.	Blood Pressure. Mm. Hg.	Urine.	
													Albumin.	Sediment.
Re.	Apr. 20	40	6 mos.	5.8	?	0	Mixed	0.29	1.5	80+	60	140- 85	S. P. T.	Negative.
	May 3			0	0	11	80	0.14					0	Negative.
Pr.	Feb. 16	62	15 yrs.	0	0	3	20	0.07	1.5	100	40	135- 85	S. P. T.	Rare hyaline and granular casts.
	Mar. 2			0	0	10	29	0.12						
	Apr. 3			0	0	2	40-50	0.14						
Cu.	Feb. 12	36	2.5 yrs.	1.4	25	0	29	0.22	6.5	30	45		0	Negative.
	Feb. 18			0	0	1	0	0.13						
	Mar. 11			0	0	15	22	0.25						
	May 1			0	0	6 wks.	15-20	0.14[1]						
Pl.	Mar. 7	43	7 mos.+	1.9	?	0	15-20	0.24	2.5	35	45	120- 75	Tr.	Few hyaline and granular casts.
	Mar. 24			0	0	7	15	0.15					V. S. T.	Same.
St.	Mar. 5	23	6 mos.	5.0	110	0	40	0.28	15.5	20-25	40	105- 75	0	Pus.
	Mar. 24			0	0	4	16	0.18						
	Apr. 3			0	0	2	13	0.13						
So.	Jan. 27	21	6 mos.	4.2	?	0	Mixed	0.16	3.5	70+	35	115- 75	0	Negative.
	Mar. 18			0	0	6 wks.	30-40	0.10						
Pa.	Feb. 18	29	6 mos.	0	0	14	50	0.10	0.5	150+	60	115- 85	0	Negative.
	Mar. 10			0	0	35	140	0.12						
In.	Feb. 26	28	1.5 yrs.	0	0	?	20±	0.16	—	70	40	—	0	Ca. ox. cryst.
My.	Feb. 22	21	10 mos.	0	0	1-2	0	0.20	—	20	60	95- 65	0	Negative.
	Apr. 24			0	0	?	10-15	0.23[2]						
Sm.	Apr. 8	37	11 yrs.	0	0	?	46	0.10	—	65	—	100- 75	0	Negative.
	Apr. 29			0	0	3	40	0.08						
Ma.	Mar. 28	49	5 yrs.+	4.4	?	0	Mixed	0.22	2.5	200+	40	160-105	0	Negative.
	Apr. 11			0	0	12	70	0.11						
	May 2			0	0	34	200	0.12						
Dy.	Mar. 25	59	1.5 yrs.	0	0	2-3	20±	0.08	—	65	60	140- 85	0	Negative.
An.	Mar. 2	51	3 mos.	0.9	?	0	50±	0.16	1	60+	60	120- 75	0	Negative.
Ms.	Feb. 29	19	3 mos.	7.1	100±	0	Mixed	0.28	5	50	—	110- 75	0	Negative.
	Mar. 7			0	0	2	11	0.17						
	Mar. 26			0	0	3	18	0.14						
	Apr. 3			0	0	11	30	0.14						
Eu.	Feb. 27	55	12 yrs.	0.5	?	0	70-80	0.34	1	80+	20	155- 80	S. P. T.	Negative.
McT.	Feb. 24	35	6 yrs.	2.4	25	0	22	0.28	3.5	60	—	120- 70	0	Ca. ox. cryst.
	Mar. 13			0	0	15	39	0.13						
	Mar. 26			0	0	6	21	0.18						
Go.	Mar. 23	34	4 yrs.	0	0	?	?	0.18	—	60+	—	130- 85	0	Negative.
Ra.	Feb. 22	14	3 mos.+	+	?	0	40±	0.24	3.5	35	—	100- 50	0	Negative.
	Mar. 17			0	0	5	15	0.10						
	Mar. 25			0.8	?	0	30	0.24[3]	0.5	55	—			
	May 17			0	0	4	25	0.07						

Rm.	May 3	50	2 yrs.+	6.2	89	0	Mixed	0.26	6.5	40	—	115- 75	0	Negative.
	May 11			0	0	1	0	0.15						
	May 20			Tr.	Tr.	0	42	0.19						
	May 25			0	0	4	20	0.09						
	May 30			0	0	9	21	0.10						
Wa.	Apr. 18	31	1.5 yrs.	2.9	104	0	100	0.36	6	80	—	130- 85	S. P. T.	Rare hyaline cast.
	Apr. 20			3.3	71	0	100	0.35						
	Apr. 26			0	0	2	5	0.17						
	May 11			0	0	17	70	0.10						
	May 20			0	0	8	10	0.09						
La.	Apr. 25	70	5 yrs.+	0	0	?	20±	0.16	—	110	—	140- 65	0	Negative.
	May 2			0	0	1	51	0.13						
	May 11			Tr.	Tr.	0	120	0.14						
We.	May 10	54	8 mos.	5.1	?	0	Mixed	0.26	1.5	100+	55	140- 95	S. P. T.	Few hyaline and granular casts.
	May 17			0	0	6	24	0.08						
	May 29			0	0	18	50	0.10					0	Few casts.
Co.	May 3	50	1.5 yrs.	4.0	?	0	Mixed	0.28	2.5	60	43	125- 70	V. S. T.	Hyaline and granular casts.
	May 11			0	0	6	25	0.14						
	May 25			0	0	7	0	0.08						
	May 30			0	0	12	31	0.11						
Rl.	Mar. 3	30	2 yrs.	5.5	80-100	0	20±	0.17	10.5	15	—	105- 60	0	Few hyaline casts.
	Mar. 13			0.16	3.7	0	0	0.11						
	Mar. 25			0.65	15.0	0	6	0.18						
	Apr. 20			0	0	9	11	0.12					0	Negative.
Str.	Apr. 28	41	3 yrs.	Tr.	Tr.	0	?	0.22	0.5	100+	45	265-155	S. T.	Many hyaline and granular casts
	May 9			0	0	10	100	0.13				200-130		
Hu.	May 14	49	7 yrs.	3.0	?	0	Mixed	0.15	6.5	25	32	140- 90	S. P. T.	Many hyaline and granular casts.
	May 25			0	0	5	20	0.15						
	May 29			0	0	4	10	0.12				120- 80		
Fr.	Feb. 12	48	2 yrs.+	2.8	44[4]	0	50	0.76	—	—	—	—	V. S. T.	Many granular casts.

Explanatory Notes.

Blood for sugar determinations was taken in the morning with the patient fasting, and precipitated promptly, except in two instances, when the samples were taken three to four hours after a light breakfast, as noted below.

Diets are indicated as "mixed," either when the patient had not had a restricted diet, or when the restrictions had been lax, or not observed.

When the carbohydrate in the diets was not known definitely that fact is indicated by a "±" sign, or by giving the probable limits, as 80-100.

In some instances the maximum limit of tolerance was not determined, as the patient had to leave the hospital. This is indicated by a "+" after the figure given, which is the limit reached in the wards.

Many of the admission blood sugar determinations were done when we did not have the corresponding 24-hour urine, so the total output of sugar cannot be given.

The urinary sugar is determined by the Benedict Methods both qualitatively and quantitatively.

[1] This sample was taken when the patient returned to the Out-Patient Department, and was about four hours p. c.

[2] As above, three hours p. c.

[3] This patient left the hospital on Mar. 17 but returned to the Out-Patient Department on Mar. 24, with 4-5% sugar in the twenty-four hour specimen. He at once returned to the hospital and was starved. The single specimen of urine, Mar. 25, showed only 0.8% sugar, but his blood sugar on that date still showed the effects of his previous overeating.

[4] Passed 44 grams sugar in twelve hours. Afterwards was incontinent.

The threshold of sugar excretion varies in different diabetic individuals, and apparently in the same individual at different times.

Sometimes the blood sugar returns to normal under treatment, and this is generally in the milder cases, though there are some exceptions to the rule.

A persistently elevated blood sugar may be an indication of the greater severity of the disease, or it may occur in apparently mild cases, but generally associated in the latter instances with some renal impairment.

By keeping the carbohydrate intake well below the limit of tolerance, as shown by the appearance of glycosuria, it has been found that the blood sugar will almost, if not quite, sink to normal, and our experience leads to the belief that efficient treatment can be carried out in most instances using the urinary sugar alone as the therapeutic guide.

There are undoubtedly a certain number of severe cases with marked acidosis or nephritis in which the true picture of the condition is much illuminated by direct blood examinations, both for sugar and alkali reserve.

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DISCUSSION.

Dr. Harry W. Goodall, Boston: Dr. Joslin emphasizes the importance of early treatment of diabetes. I feel very strongly that in the absence of any other diseased condition the duration of life must necessarily depend in a large measure upon the intelligent early treatment of the patient.

One is very much impressed by the importance of early treatment in studying the out-patient cases. For the past seven years I have taken charge of all the diabetics in one of the out-patient clinics, and during the last two or three years the present method of treatment has been followed out as carefully as it is possible for one to carry it out. The conditions in the out-patient clinic are not unlike the conditions that one meets with in private work, especially the general practitioner.

The improvement in the treatment is most striking. Up to within the last two or three years the treatment was more or less spasmodic. We had little control of the patient, and the results were not especially satisfactory. At the present time with a clinic of about sixty diabetics, the majority of whom represent the early cases, the patients are grouped together into a class, being treated as a class and treated individually. All of the patients are under the control and direct treatment of the young woman who has been trained in the treatment of diabetics, and is not a medical person. She is under my own supervision. Out of the sixty patients there have been but two deaths, which I think were the result of dietetic errors. In both instances it seemed impossible to get the proper food for the patient. Of course it is only fair to say the most severe cases were sent to the hospital for treatment, and then after they had become sugar-free were sent back to the clinic, but during this period of two or three years all the patients have been able to carry on their daily activities. The greater part of the time they have been free from sugar, and there have been few, if any, recurrences.

One of the most interesting things has been the treatment of the male cases. It has been very difficult to get hold of the men. They will not give up their work to come to the clinic, and we have succeeded in getting the mothers or the wives, and they have come for directions and have carried out our instructions at home. Out of the sixty cases about ten patients have paid little or no attention to the treatment whatever. They would come spasmodically, as they did in the days of old, but the remaining forty-five or fifty have attended most diligently, and have tried in every way to carry out our treatment and suggestions.

I think the success of the clinic has depended entirely upon the young lady in charge. She has shown great patience. When sugar has returned she has taken pains to find out what caused the return of the sugar, whether it was the fault of the patient or fault in the preparation of the food or what-not, and instead of scolding the patient, has gone all over the subject again and has taken every possible pains for encouragement in the work.

Whenever questions have arisen or whenever new patients have come with diabetic complications, they are immediately taken to the class and demonstrated as a warning of what will happen to them if they don't follow instructions. Under this system we have had the most satisfactory results, and I am sure even more satisfactory to the patient than to the physician.

Dr. Walter R. Bloor, Boston: Because of the practically universal belief that diabetes is a disorder of the carbohydrate metabolism, the fact that there is a disturbance of the fat metabolism at the same time has been rather lost sight of, although some of the important symptoms of diabetes—for example, acidosis—are due, without question, to the disturbance in the fat metabolism. One reason for the failure to take the fats into account is no doubt the fact that glycosuria is the symptom which is readily recognized and measured. There are plenty of methods for determining the sugar in the urine, while there has been no satisfactory or simple method for determining the fat; also the sugar is excreted while the fat is not, or at least we don't know of any fat secretion. A number of conditions indicate a disorder of fat metabolism. Whether the primary disturbance is a disturbance of the fat metabolism or of the carbohydrate metabolism is still a question.

In many diabetics obesity is a beginning sign, that is, obesity precedes the glycosuria. From fifteen to forty-five per cent. of diabetics begin with obesity. Then there is the ever-present symptom, acidosis, which is almost certainly due to failure to burn the fats. And, third, there is the lipemia, that is, the milky appearance of the blood, due without doubt to finely suspended fat.

This lipemia was a very common symptom in the days of the protein-fat treatment for diabetes, and a great deal of stress has been put on its presence by certain physicians, particularly in Germany. Inasmuch as the first stages of fat metabolism are believed now to take place in the blood, I considered it a great opportunity when I was allowed to examine the fat in the blood of Dr. Joslin's cases of diabetes. I found in the main two things: In mild diabetes there is practically no change in the fat of the blood. In severe diabetes the blood fat may be increased to 100 or 150%. This increase in blood fat includes not only what we ordinarily call fat, that is, glycerides of the fatty acids, but also "lecithin" and cholesterol. It is quite remarkable, it seems to me, that the relations between these constituents are practically those of the normal conditions. They are all increased together, and the relationships between them are not changed. This would seem to me to indicate that the fat metabolism in these cases under this treatment is practically normal, although on a higher plane. Under normal conditions the fat metabolism proceeds with a relatively low concentration of these fat constituents. In severe diabetes it requires a much greater concentration to, so to speak, push the reaction to its completion.

The other point which I wish to mention is that in Dr. Joslin's patients there was no lipemia, that is, the blood plasma was in all cases perfectly clear. For this reason I am disposed to regard lipemia as due to a fault in feeding,—that in the cases where it appears too much fat is being given. One point of Dr. Joslin's treatment is the regulation of the fat early in the treatment, and I believe that the disappearance of the lipemia is due to this fact, and that if lipemia is present it means simply that the patient is getting too much fat. There is no question that the fat metabolism is disturbed in diabetes, and if the lipemia occurs it means simply that the patient is getting more fat than he can take care of, even if he is getting only ten grams a day.

Dr. G. Carroll Smith, Boston: I would like to call attention to one or two things which I think we are in duty bound to mention and might be neglected by somebody else if I didn't call attention to them. I feel, for one, and I know from personal contact with many of you gentlemen that we all feel greatly indebted to Dr. Joslin and his co-workers for the admirable work that they have been doing for a number of years to help clarify the subject of diabetes, and I know you will all be glad to hear, if you have not already read, that in very many of the American cities the Joslin system is now in vogue, and especially is this true in the city where very advanced medical work is being done, namely, Chicago. The work being done today in the Cook County Hospital is entirely based on Dr. Joslin's system, and careful records are made according to his suggestions and according to the papers which he has read heretofore describing clearly the manner of procedure.

One other point which I think we ought to bear in mind today is that Dr. Joslin is fairer in his consideration of statistics than has usually been customary with medical men. As a matter of fact many of these cases that enter into his statistics are comatose when he first sees them, and of course we all know that such cases should not enter a table of statistics from any rational standpoint. There are other factors besides acidosis that come into consideration in a discussion of the cure of diabetes, because many diabetics die of other complications fundamental to the diabetes itself. The final acidosis undoubtedly is due to the faulty metabolism of fat in most cases, but it may be also in many cases due to defective circulation, as seen in cardio-renal disease. Such cases seem fairly to belong under the head of symptomatic, rather than idiopathic diabetes in the compilation of Dr. Joslin's statistics. Therefore, the high mortality of the same need not be discouraging.

A Member: I would like to ask a question of Dr. Joslin,—how he knows when he has a case of diabetes how long the duration of the disease is; whether he considers the statistics throughout the state of any real value, when most of us have to guess at the duration of the disease when we make out the death certificate.

The Chairman: I hope Dr. Joslin may be able to reply to that question. That is the only question I wanted to put to him,—when they speak of a case of diabetes of one year's duration, or six months', how have we any idea what the duration has been before the patient comes to us?

A Member: I would like to ask Dr. Joslin if he can tell us what he does by way of treatment, or how he manages the diet.

The Chairman: I would say in defence of Dr. Joslin that we didn't ask him to go into the question of treatment, as that would be a long subject. He has picked out just a little special point in the treatment of a large number of cases.

The Chairman: As we are not to have the pleasure of hearing from Dr. Janeway, I would like to give you a very few statistics taken from an article published by Dr. Janeway, these statistics being taken from a large number of life insurance companies. Life insurance companies, of course, look upon life merely as a matter of dollars and cents. The statistics are really quite interesting. The average blood pressure in nearly three thousand cases between thirty and forty was 123 to 128; between forty-five and sixty it was 128 to 134. Now, in 2600 cases accepted with a blood-pressure of 142 the average mortality was that of all cases. Of 525 accepted with a blood-pressure of 152 the mortality was 30% up. Of 1970 rejected, with a blood-pressure over 160, the mortality was almost double. I acknowledge that these figures were perfectly startling to me, but such they are quoted from a large life insurance company of New York.

Dr. Joslin (closing the discussion): A question has been raised, Mr. Chairman, about the treatment. I will just pass around some of these cards to show the methods that several of us have adopted here. In the second place, about the statistics, that is an excellent point that was raised. I shall be very glad to answer it. For example, the total number of fatal cases of diabetes mellitus in Massachusetts for 1915, for which you gentlemen signed death certificates, was 648; but unfortunately the gentlemen here and elsewhere in the State did not record the duration of the disease in 278 cases at all, and in two cases recorded it as less than 24 hours, so only 350 to 370 cases were available for statistics, even a still smaller number than that as shown by the footnote I have used. Any statement about statistics of the duration of diabetes would be open to serious question. It is very difficult to say. In Boston, for instance, I think nearly one-half of all the cases that are recorded of deaths from diabetes had to be thrown out in making up the statistics because no duration whatever was put down. It is an important thing to endeavor to find out what the duration is, because that gives us some idea to go by as to treatment. As to the onset of a case of diabetes, sometimes you can tell, sometimes you can't. In a considerable number of cases it comes on acutely. For instance, out of my list some eighty odd cases were discovered by life insurance. On the other hand, in a good number of the cases the history showed the absence of sugar in the urine quite a long time before the disease was discovered.

A word about mortality. It really is the fact, as Dr. Smith pointed out, that a large number of cases that die are severe when one first sees them. Of course I see a great many cases of that kind for the first time. This last year one died of cancer, two of gangrene, one of appendicitis. To Dr. Bloor we are specially indebted for his painstaking work about the fat. I think few of us realize that a painstaking analysis takes about three hours, and that the fat is an extremely important matter, in fact the key to the situation of acid-poisoning today; and we are very fortunate here to have Dr. Bloor, who stands perhaps first in the world in the work along this line, investigate this problem.

To the other gentlemen, too, I am sure you, with me, are much indebted for their painstaking research work. It takes a great deal of time to carry through these blood analyses. They are easy to describe, but it is hard work, and what comes from hard work counts in the end.

A Member: How does age affect the mortality?

Dr. Joslin: All these data about mortality I have written up in extensive form, and I have really gone into it in great detail. For instance, all the cases have been classified according to the mortality, according to the onset of the disease. For example, in 1050 cases they are classified by mortality, and then one group taken up after another in really very great detail.

PAPERS ON NEPHRITIS, WITH THE DISCUSSION.

Tests of Renal Function from the Standpoint of the General Practitioner.

By Francis W. Peabody, M.D., Boston.

[From the Medical Clinic of the Peter Bent Brigham Hospital, Boston.]

During the past five years the attention of a large group of research workers in clinical medicine has been devoted to the development of tests of the functional capacity of the kidneys. Many methods have been devised, and exhaustive studies, both experimental and clinical, have been carried out to determine the comparative value and significance of the various tests. There has resulted a mass of new and important information which forms a landmark in the progress of scientific medicine, and which throws much light on the pathological physiology of nephritis. In a comparatively short period so much definite advance has been made that the time has now come when it is fair to take stock of our knowledge and to attempt to determine wherein and how far it is of direct benefit to the practitioner of medicine. In so doing it will be well to consider first the general significance of renal function tests, and second, the relative value of the various methods which have been suggested.

It is important to appreciate that these tests are intended to be indices of impaired function. They are in no sense primarily diagnostic measures, although in certain conditions they may assume a diagnostic significance. Until the efficiency of the kidneys is decreased to the extent that they are unable to perform their excretory functions in the normal manner, the tests give, for the most part, no evidence of renal disease, and, on account of the great "factor of safety" with which all the organs of the body are endowed, there may be a very considerable destruction of renal tissue without impairment of renal function. The early diagnosis of nephritis must continue to be based, as heretofore, chiefly on the clinical history, the physical examination, the blood pressure, and the general characteristics of the urine. It was hoped that those functional tests which consisted in determining the ability of the kidneys to excrete certain definite substances (urea, lactose, salt, water) might be of value in the differential diagnosis of various morphological types of kidney lesion, but, unfortunately, careful study of the post-mortem findings has failed to reveal a constant relationship between inability to handle the test substances and any specific anatomical renal condition.

Broadly speaking, the chief value of the renal function tests lies in the field of prognosis. They give an index of the severity of the case, provided that it is so advanced that there is already functional impairment as well as anatomical involvement of the kidneys. They may frequently give the first and only indication of a very serious condition which is masked by a physical examination showing nothing alarming, and a urine examination which is only slightly abnormal. They serve as guides as to the progress of the case from month to month, and thus incidentally aid in directing treatment. They are, moreover, often of the greatest practical value when they give no positive information beyond the fact that the functional capacity of the kidneys is normal. This permits the giving of a prognosis which is, temporarily, at least, favorable, and which is based more securely than it could be by any other means.

However, few laboratory tests in clinical medicine are absolutely specific, and even in considering the prognostic value of the methods for the determination of renal function there are certain exceptions which must be taken up. The group of cases in which the tests have proved themselves to be of the most practical value is that which consists of chronic nephritis associated with vascular hypertension and cardiac hypertrophy, the type of case usually classed as chronic interstitial nephritis, or arteriosclerotic kidney. This is, of course, the most common form of chronic nephritis in clinical practice. In that other group of cases, usually marked by great oedema, oliguria, absence of cardiac hypertrophy, low blood pressure and large amounts of albumin in the urine,—the type generally referred to as chronic parenchymatous nephritis, the functional tests are of much less significance. Even in extremely late stages of the disease all of the functional tests may be normal, or atypical. It is perhaps fortunate from our present point of view, that it is exactly in this group of patients that the prognosis can often be made with considerable accuracy from the other findings in the case. It should, moreover, be mentioned that in even the group of hypertensive cases there are occasional instances in which it has been impossible to correlate the functional tests with the clinical condition. Such atypical findings have occurred with all the tests that have been extensively used. Sometimes they are the result of a single observation and may be due to faulty technic; sometimes they may be due to errors inherent in the method; at other times they may depend on temporary variations in renal function which are not, however, true indices of the condition of the kidney. In cases with cardiac failure, all the tests in which the urinary output is a factor are liable to give unsatisfactory results, and it is only after compensation has been restored that an accurate picture of the renal condition is obtained. The same is true of local conditions of the urinary tract which interfere with the excretion of urine,—such as renal calculus and prostatic hypertrophy. Finally, of course, these tests have but little bearing on the prognosis with regard to what may be considered the accidental complications of chronic nephritis,—such as cerebral hemorrhage and cardiac failure.

The number of methods that have been proposed for the determination of the functional capacity of the kidneys is large, but the majority of them can be easily classified into a few groups, depending on the general principles involved.

There is thus one type of test which depends upon the analysis of blood. Owing to the inability of the kidneys to excrete the normal products of metabolism at the usual rate, these substances may accumulate in the blood, and the amount to which they are found to have increased in the blood serves as a general index to the degree of disability of the kidneys. The substances which have been most thoroughly investigated are the total non-protein nitrogen, urea, creatinin, and uric acid. Practically speaking, the two former, non-protein nitrogen and urea, are the substances which have attracted special attention. It was recognized many years ago that these substances are increased in the blood in chronic nephritis, but exhaustive studies of the conditions determining the increase, its relation to the clinical picture, and the variations which may result under different influences have been possible only since the simplified and rapid methods of Folin and of Marshall have made possible the obtaining of accurate analyses with small amounts of blood. The practical value of the non-protein nitrogen or the urea in the blood as an index of renal function is often great, but recent investigations have brought to light certain conditions under which the results may be quite misleading.[1] Thus, for instance, the normal values are much more variable than was at first supposed to be the case, and many healthy persons on a moderately high protein diet will have a urea content of the blood, which, under other circumstances, might suggest a considerable degree of nephritis. On the other hand, the level of these substances in the blood of persons with chronic nephritis may be markedly affected by diet, and figures which are well within normal limits may be found in patients with severe kidney lesions, provided they have been for a period on a low protein diet. Variations in diet may thus cause changes in the blood analysis, which are wholly independent of the actual state of the renal function.

Since the demonstration by Widal of the close relationship between sodium chloride excretion and the production of edema, and of the association of chloride retention with chronic parenchymatous nephritis, much attention has been paid to salt retention as an index of renal function. Few definite facts, however, of clinical importance, have as yet resulted. It is at present generally held that the metabolism of sodium chloride is so complicated, and so readily influenced by factors which are not yet understood, that a great deal of study is necessary before salt determinations in either blood or urine will assume a practical significance in the determination of renal function.

Another group of methods consists of those in which definite amounts of various substances are fed to the patient, and the rate of their excretion determined by means of urinary analysis. Typical of these is the test in which nitrogen, in the form of urea, is added to the usual diet. By quantitating the nitrogen in the urine, it is possible to determine whether this added nitrogen is excreted by the kidneys, and whether or not it is excreted within the time limits that might be expected in a normal individual. The successful application of such tests involves having the patients on a constant standard diet for several days before and after the test is given, the collection of accurate twenty-four hour amounts of urine, and the careful analysis of the urine for nitrogen. The results obtained are hardly to be regarded as quantitative, but rather as gross indications of renal function. Moreover, the number of days required, and the necessarily strict control of diet and urine, make it almost impossible to carry out these tests except under the best hospital conditions.

Of greater practical value is the type of dietary test advocated by Hedinger and Schlayer,[2] and subsequently developed with various modifications by European and American workers. Only one day is needed for the completion of the test, although in some clinics this is preceded by two or three days spent in getting the patient on a constant water balance. The diet is standardized, but it is liberal, consisting only of articles usual on a mixed diet, including considerable amounts of meat, soup, tea and coffee. The essential feature of the test consists in determining the reaction of the kidneys to the diuretic substances contained in the latter articles. Specimens of urine are taken at regular times, which bear a definite relation to meals, and the volume, specific gravity, salt and nitrogen output are studied. The night urine is collected as a single specimen. Under normal conditions the variations in volume, concentration, salt and nitrogen excretion follow very definite curves. As the functional capacity of the kidneys becomes impaired, such changes are noted as the relative increase in the amount of night urine, lowering and fixation of the specific gravity, and decrease in the output of salt and nitrogen. The evidence which has so far been accumulated on this type of test indicates that these abnormalities of urinary excretion may occur quite early in the course of the disease,—even before the other tests show a decrease in renal function, and it seems probable that the use of this method may be of distinct service in the early diagnosis of chronic nephritis. The test involves, besides the administration of a simple standard diet, the accurate collection of specimens of urine, and chemical analyses which can be easily carried out in any laboratory. The interpretation of the results is not always simple, and as yet the number of published reports is scarcely sufficient to permit of broad generalizations as to its diagnostic and prognostic value, or its relative significance in comparison to other tests.

Another type of test for renal function consists in the comparison of the concentration of a given substance in the blood with the rate of its excretion in the urine. Ambard first showed that under normal conditions the rate of excretion of urea, or the amount excreted in a certain unit of time, depends on its concentration in the blood. The relation between the concentration in the blood and rate of excretion is known as the Ambard coefficient. In this country McLean,[3] at the Rockefeller Hospital, has devoted much attention to the development of the test. He expresses the relation of the rate of excretion of urea in the urine to the urea concentration in the blood by what he terms the Urea Index. Normally 100 or over, a drop in the Index signifies a lessening of the capacity of the kidneys to excrete urea. This method, which compares the amount of urea in the blood with that excreted in the urine in a unit of time is certainly much more reliable than are the methods which consist of blood analysis alone, for it has been shown that on the one hand high blood values may be associated with a normal rate of excretion, and on the other hand, normal blood values may be found when the Urea Index indicates a very low functional capacity of the kidneys. Considered from a scientific point of view, the Urea Index probably gives the most reliable information concerning renal function. Its chief disadvantages, as far as they are known at present, are technical. In order that it shall be of any value, the Index must be based on extremely accurate chemical analyses of blood and urine. These can be carried out by well-trained technicians in hospitals and in private or commercial laboratories; but the sources of error are such as to put the test beyond the reach of the general practitioner.

The last type of renal function test to be considered is that which depends on the ability of the kidney to excrete some foreign substance. By far the most important method of this type is the now well-known phenolsulphonephthalein test of Rowntree and Geraghty.[4] This consists in the intramuscular injection of 1.0 cc. of a solution of the dye, and the determination of the percentage excreted in the urine during a period of two hours, by means of a simple, rapid colorimetric method. The test is so easy to perform that it can be used by any one, either in the office or the home, since no special technic is necessary, and no complicated apparatus is required. During the last few years the phthalein test has been tried out extensively in many clinics in this country and in Europe, and in general the results have proved extremely satisfactory. It has been shown by Thayer and Snowden[5] to give a satisfactory indication of the extent of the pathological lesion in the kidneys. Barring the conditions already discussed, in which any of the tests of renal function may fail to give satisfactory indices of the clinical condition, the phthalein test appears to be very reliable. Its value has recently received important confirmation in the comparative studies of McLean,[6] who has shown the phthalein output runs practically parallel to the Urea Index. The only serious divergence was found in patients with cardiac insufficiency, who were excreting very small amounts of water. These subjects excreted the phthalein more readily than they did the urea. The Urea Index is, moreover, according to McLean, a more delicate indicator in that it draws a somewhat sharper line of demarcation between normal and abnormal cases, while in the very severe cases, slight variations in the Index are of more significance than are corresponding variations in the phthalein output.

In reviewing the tests that have been advocated for the determination of the functional capacity of the kidneys from the point of view of the general practitioner of medicine, several criteria must be applied. In order that a test may be widely used it must not be time-consuming, it must not involve highly specialized technic or costly apparatus, and it must give sufficiently accurate information to warrant its application. The tests depending wholly or in part on blood analyses are too complicated to come into general use outside of hospitals. The dietary tests require at least twenty-four hours and involve some chemical analyses, but they are quite within the field of most medical men. They are only very roughly quantitative, but they will probably prove to be of aid in the early diagnosis of renal lesions. Time and further experience will show whether they give information of value, which cannot be obtained in an even simpler manner. At present the phthalein test seems to stand out as being the most generally applicable of the methods. It has the disadvantage of depending on the excretion of a substance foreign to the body, but comparative studies have shown that the conditions governing its excretion are similar to those governing the excretion of urea. It is rapid; it is simple; it is, on the whole, very reliable. It is so easy a method of obtaining an accurate basis for prognosis in cases of nephritis, and it is so helpful as a guide to treatment, that it well merits the reputation it has achieved, and it should be even more widely applied than it has been hitherto.

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Eye Changes in Renal Diseases—Their Diagnostic and Prognostic Value.

By Peter Hunter Thompson, M.D., Boston.

The object of this brief paper is to bring to your attention the findings, diagnostic value, and prognostic value of the eyes in renal conditions.

During the years 1827 and 1836, Bright called attention to the impairment of vision experienced by certain patients having renal disease. Ever since that time the eye symptoms have attracted more and more interest. As none of the characteristic changes occurring in the eyes can be seen with the unaided eye, it remained until the invention of the ophthalmoscope, in the year 1851, before the intraocular changes could be seen and studied. After that, in course of time, the findings in the eyes became so well understood that they have, for many years, been of real value in making the diagnosis and a great aid in giving the prognosis.

All physicians may be aware of these facts, but many do not take advantage of the valuable information gained by an ophthalmoscopic examination. One familiar with the use of the ophthalmoscope can make such an examination quickly and safely, and with little or no inconvenience to the patient.

It is a very common experience of every ophthalmologist to find, while doing routine office or out-patient work, changes in the eyes of patients which soon lead to a correct nephritic diagnosis, many of whom simply come complaining of the ordinary symptoms of eye-strain, or, at most, blurring of the vision, all of which they expect to have corrected by proper glasses. When told of the real cause of their symptoms, and advised to consult their regular physician for examination and treatment, and his examination of the patient, together with the urinalysis, confirms the ophthalmologist's suspicion, it all seems quite wonderful to those not familiar with this possibility. This very likely accounts, by hearing of these cases through relatives and friends, for so many patients asking during or after an ophthalmoscopic examination, if any signs of kidney disease were discovered in their eyes.

While physicians may practically always be able to make a diagnosis of renal conditions from the symptoms and general examination of the patient, together with the urinalysis, without the necessity of making an ophthalmoscopic examination, they cannot begin to give the prognosis with the same degree of certainty which would be possible for them if they were also sure that the typical eye changes were present. Even though the examination of the fundi should prove to be negative in a case known to have nephritis, this fact is also very helpful in giving a more accurate prognosis.

The value of an examination of the eyes, in this connection, may be over-estimated by some, and under-estimated by others, but I hope to give you a sufficient number of facts recorded by different observers, and obtained by personal experience through private practice and my services at the Massachusetts Charitable Eye and Ear Infirmary and the Boston City Hospital, to enable you, as medical men, to judge for yourselves.

The clinical changes observed in the eyes are confined chiefly to the retina, optic nerve, and choroid. Retinitis, or the so-called albuminuric retinitis, shows itself by loss of transparency, white spots or patches, exudate, and hemorrhages in the retina, associated with certain changes in its blood-vessels, and rarely by separation of the retina itself.

Loss of transparency of the retina is frequently very evident. When viewing the fundus, the normal retina, being transparent, is not seen, excepting its blood-vessels, as we simply see the red reflex of the choroid showing through, but when it becomes inflamed, it sometimes takes on a more or less general cloudy appearance, resulting from infiltration and edema, obscuring, in proportion to its density, the normal red reflex beyond.

White spots or patches are the most characteristic and frequent changes observed in the retina. Wherever located, they render the retina opaque at these points, presenting a very striking appearance as they are seen against the red background, grouped chiefly about the macula and optic disc. They vary much in size and shape, and often coalesce, particularly at the posterior portion of the fundus, and may even form, in this way, a complete opaque area surrounding the optic disc. We frequently see white glistening spots, drawn out into lines, radiating from the macula, but not involving it, arranged in the form of a star, and when present, they are very characteristic. This stellate figure is not always complete, being represented at times by only one, two, or three quadrants, or there may be simply an occasional white glistening dot in this vicinity.

Exudate is sometimes seen, but it varies greatly in appearance and amount in different cases and the various stages of the disease. It is usually more abundant in the neighborhood of the optic nerve, and frequently hides more or less completely the view of the retinal vessels and the outline of the disc. In many of the cases, there is no visible exudate.

Hemorrhages are usually present. They may be large or small, many or few in number. Sometimes they form lines along the course of the vessels, and occasionally they are represented only by mere dots. The hemorrhages may or may not have well defined borders and may be round or irregular, while others present a flame-like outline, depending upon the anatomical arrangement of the layer of the retina where the blood is confined.

Retinal vessels, the veins in particular, are usually more or less engorged and tortuous. The arteries generally show signs of arteriosclerosis. Thickening of their walls renders them less translucent, and sometimes they present a beaded appearance or have white lines or stripes along their course. Thickening of the walls of the arteries often compresses the veins when they happen to cross them, and thus impedes the venous flow.

Separation of the retina is quickly detected, when present, as the separated portion usually soon takes on a grayish appearance, hiding, more or less completely, the normal red reflex. It projects forward, making it necessary to revolve a different lens before the sight-hole in the ophthalmoscope, in order to focus on its surface, so as to make it possible to see clearly the retinal vessels on the elevated area. This condition is quite often seen in the acute nephritis of pregnancy; otherwise it is rarely found.

The optic nerve usually shares sooner or later in the inflammation of the retina and occasionally shows the first signs of trouble in the eyes. The optic neuritis varies from a slight reddening of the optic disc, with some blurring of its borders, to marked swelling and exudate which completely obscures the outline of the disc, and it may even present the appearance of choked disc. The usual picture observed in renal cases is a neuro-retinitis, both the retina and the optic nerve being involved, each sharing the same or one more than the other, in the inflammation.

The choroid is very likely more often involved, especially its blood-vessels, than we are able to make out with the ophthalmoscope, but we do see cases having well marked patches of choroiditis associated with the retinitis. The choroidal patches may finally become white centrally, from destruction of the choroid at this point, showing the white sclera, having dark pigmented borders, but they are readily distinguished from the white opaque patches due to the retinitis.

Associated with these changes, there is, sooner or later, impairment of vision. The amount of visual disturbance depends chiefly on the part of the eye involved. Slight changes in the macular region, or center of acute vision, will reduce the sight more than extensive changes in other parts of the fundus. On the other hand, cases showing quite extensive changes, away from the macular region, may retain good central vision for several months before it is finally reduced by involvement of this area.

While we do get other changes in the eyes in renal affections, those mentioned are the ones we rely on chiefly in making the diagnosis and, in nearly every case, it will be found to be correct. There is a great variation in these findings in different cases, and in the various stages of the same case. In some, the white spots or patches of the retina will be the prominent feature, in others, the retinal hemorrhages, and in others the optic neuritis. Both eyes are usually affected sooner or later, but the relative amount of involvement of each may vary greatly at different times.

Many of these renal cases present a picture so strikingly characteristic, when viewing the fundus, that the examiner is able, with but few exceptions, to make the diagnosis from this alone; but syphilis, brain tumor, certain forms of anemia and diabetes, especially the latter, occasionally show similar changes in the fundi, therefore it is wise also to have a careful examination of the urine in every case. However, when seeing such a picture we know at once that if it is not caused by nephritis it is due to some other equally serious disease. Even when the changes in the eyes are very slight, and not especially typical either, they often lead to a correct diagnosis by the ophthalmologist suggesting other examinations, with the view of finding the cause of the local disturbance.

The percentage of all renal cases, showing changes in the eyes, seems to vary considerably as given by different observers. Perhaps about twenty-five per cent. would be a fair average. Quite a number of people have the impression that every case of kidney disease will show signs of its presence in the eyes. Of course this is not so. No doubt there are minute changes, particularly in the blood-vessels, long before they become sufficiently well marked, so as to enable us to distinguish them with the aid of the ophthalmoscope.

However valuable the findings in the eyes may be in making the diagnosis, it is the reference to the prognosis regarding the duration of life of patients having renal disease, in whom we also find characteristic changes in the eyes, that is of special importance, as it can be given with a far greater degree of accuracy than by the results of all other examinations combined. In making such a diagnosis, you are, in reality, rendering a death sentence upon the individual, which will probably take place within two years, even in those who are apparently enjoying good health at the time, and able to attend to their usual occupation. The duration of life, after the eyes become involved, is shorter in the poorer classes and longer in the better classes. It is usually longer in women and shorter in men in all classes. The prognosis is much more unfavorable when associated with chronic nephritis, than with the acute disease. The outlook is quite favorable, both in regard to life and vision in the acute form when the renal disturbance is entirely due to scarlet fever or pregnancy, especially in the latter, but if separation of the retina takes place, the vision may remain poor in the eye thus affected. Patients in whom we find an albuminuric retinitis, associated with chronic kidney disease, usually die within one or two years; rarely do they live longer than three, more often it is less than one year. Life has been prolonged occasionally for longer periods, when such patients have been able to provide favorable hygienic surroundings combined with proper diet and careful treatment. Under such conditions, the time has varied in exceptional cases, even up to twelve years.

A good deal has been said and written regarding the duration of life after the eyes become involved in these renal cases, by different writers and observers, and their figures and impressions naturally vary considerably because their work has brought them in contact with different classes of patients. Some have gathered their figures from private patients alone, others from hospital cases altogether, and others from hospital and private cases combined. Out of 155 private cases reported by Belts, 62% of them died inside of a year, 85% within two years, 14% lived longer, while out of 175 hospital cases, 85% died inside of a year, 93% died within two years, 6% lived longer. Bull reported 103 cases and 87% of these died within two years. Out of a series of 100 cases collected by Bell, from the private practice of different men, 73% died within one year, and 94% within two years. In a collection of 419 reported cases, Rogers found that 90% of them died inside of two years. Several other series of cases, some larger and some smaller, have been reported by different men, but those given will serve to illustrate sufficiently the great aid in giving the prognosis in renal cases, regarding the duration of life, furnished by the additional knowledge of the presence of characteristic changes in the eyes, especially when we realize how uncertain it is in such cases when the eyes do not present these changes.

DISCUSSION.

DR. CHANNING FROTHINGHAM, JR., Boston: Mr. Chairman and members of the Society: After listening to these two very interesting papers, it is hard to do anything more than to simply reiterate what has already been so completely expressed.

There is one point on which I feel that I should like to criticize Dr. Peabody's paper. I fear, however, that probably none of you will agree with me. I think we ought to stop using the term, "chronic interstitial nephritis." It seems to me it is a rather vague term, although well grounded in the minds of the profession. If one looks at Dr. Mallory's excellent book on pathology, and sees how he has gone back to the original lesion in his classification of chronic kidney disease, it seems only reasonable to adopt his nomenclature, so that from the name, one may draw a mental picture of the disease from the outset. Chronic vascular nephritis is the name which should be applied to most of the cases of interstitial nephritis. At the present time, however, it is impossible by our methods of diagnosis to tell the difference between chronic vascular nephritis and the late stages of a chronic glomerulo-nephritis, although under the microscope the difference is readily seen.

Before emphasizing the points which Dr. Peabody has mentioned so well, I think the first thing for the practitioner of medicine to realize is that it is practically impossible with the means which we commonly use for making a diagnosis of nephritis to make an accurate prognosis. In other words, the examination of the urine for albumin and casts and estimation of the blood pressure only help us in making a diagnosis. The amount of albumin and casts in the urine is simply indicative of the amount of kidney destruction which is going on at that time. They are not indicative of how long that particular kidney is going to last. An increased blood pressure is probably indicative of a chronic nephritis. It is not indicative of the severity of the nephritis. Frequently we see cases as they reach their terminal stages and are becoming uraemic with the blood pressure considerably less than people who are apparently well and active.

The examination of the eye grounds may be of some prognostic as well as diagnostic value. For, although evidence of nephritis, when found in examination of the eye-grounds, as Dr. Thompson has pointed out, is a bad prognostic sign, you must remember that a good many cases come to a fatal termination without evidence of changes in the eye-grounds, at least so far as they may be detected by those who are not expert in an examination of the fundi. Therefore, after making the diagnosis of nephritis, you either have to guess as to the length of life of the individual patient, or else you have to turn for aid to some of these functional tests which have been presented. Of the functional tests, I agree with Dr. Peabody, that the phthalein test at the present time is probably the most satisfactory for the general practitioner.

Let us remember that in the early stages of chronic nephritis, practically all of these renal function tests may be normal, and, therefore, that they are only of prognostic value as the nephritis becomes more advanced. In certain cases of nephritis, the phthalein test may be normal, and in certain cases of passive congestion without renal involvement it may be abnormal. It is, therefore, advisable to do more than one test for renal function, if possible, in each case. The other test which seems to me to be practical for the practitioner to make, is the examination of the blood for urea or total nitrogen. I do not mean that the practitioner will have to make the chemical analysis himself, but that he should simply draw the blood under the conditions which are recommended in these tests, and then send it to some laboratory equipped for making such examinations. In a given case of chronic nephritis, therefore, after making the diagnosis, you should turn to the functional tests. First estimate the ability of the kidney to eliminate phthalein. If that is normal, it is usually safe to assume that the nephritis is not far advanced, and further studies are not so necessary. If that is abnormal, however, before a definite prognosis is made, other tests should be done. Either the general practitioner can collect the blood and send it to a laboratory for a study of the urea or nitrogen, or he may avail himself of one of the various clinics which are now springing up throughout the country at which, in a few days, careful studies of the renal function may be made. This in no way should interfere with the relation between the practitioner and his patient, for it is understood that such patients are going to the hospital only for functional studies, and not for treatment.

There is one other point that might be mentioned here. All of our functional tests, or at least the great majority of them, at the present time, simply tell us how sick a nephritis case is. We hope, then, in the future, that functional or other tests will be devised which may be applied to mild cases of nephritis or to incipient cases, so that we may make an earlier diagnosis and institute more intelligent treatment in time to vary materially the course of the disease.

Dr. George S. Derby, Boston: Mr. Chairman and gentlemen: Dr. Thompson has covered this subject of the eye changes in nephritis so well, that all I can do is to add, perhaps, one or two points which, on account of lack of time, he was unable to put in. The first thing I want to call your attention to is the fact that albuminuric retinitis is not the only process which occurs in renal disease. We have also the so-called uraemic amaurosis, which is an entirely different proposition, due to uraemic poisoning, and which comes on as sudden blindness in from eight to twenty-four hours in the patient, accompanied by the other signs of uremia and often coma. This clears up in from twelve to twenty-four hours, the vision comes back to normal, and an examination during the time of blindness discloses absolutely nothing in the fundus whatever, because the process is situated back in the brain.

Now, the term albuminuric retinitis is a misnomer. It should be called renal or nephritic retinitis, because the albuminuria has nothing at all to do with it.

As Dr. Thompson said, twenty-five per cent. would be a fair estimate of the proportionate number of cases in which it occurs. Some estimates run below that. Probably if cases of this nature were followed until death occurred, we should find it in about one-third, thirty-three per cent. In the nephritis of pregnancy, it is rather less common.

Now, I feel that I differ a little bit from Dr. Thompson in what he said about recognizing these cases of albuminuric retinitis. It seems to me that the cases where you can say right out, "This is surely a case of renal disease," are in the minority. There are a great many cases where the appearance suggests it, but where it is not absolutely typical and you can only surmise it. In addition to that, there are a great many cases where the changes are extremely slight and you must have your other examinations made before you can say that the changes are due to a nephritis.

In a paper by Dr. Slocum, of Ann Arbor, Michigan, which is going to be presented a week from today at Detroit, out of seventy-three cases of nephritis where the eyes were examined very carefully, only five were found in which the typical star figure of albuminuric retinitis was present—only five out of seventy-three, that is, about six per cent.

It is in the cases of interstitial nephritis where the diagnosis is more often made by the oculist first. The patient suddenly notices a blurring of vision, goes to the oculist, and a well developed retinitis is seen. I remember seeing such a case when I first started in practice. The patient, who was under treatment by a very good general practitioner for indefinite gastric symptoms, had not had her urine examined. She showed a well developed nephritic retinitis and was dead in two weeks' time.

Now, in all probability, according to the best opinion of the present day, the renal retinitis develops only if the disturbance in renal function has given rise to considerable changes in the arterial system, increased blood pressure and usually hypertrophy of the left ventricle. The disease is very rare under twelve, is common between thirty to sixty, most often seen between fifty to sixty; and except in the pregnancy cases it is seen very much more often in men. You see two cases in men to one in women. In a great majority of cases the disease appears in both eyes with a very short interval between, a few days or weeks. There are, however, some cases on record where the disease has remained entirely monocular, confined to one eye up to the time of death.

There are also changes appearing in the eyeground which cannot be classed as retinitis, and which appear much earlier in the disease. I refer to the vascular changes which are seen in the eyeground and which usually mean that there is a cardio-renal lesion. I think that in the recognition of these lesions the ophthalmologist can be of great use to the general practitioner. One needs a considerable amount of skill and perseverance to discover these lesions, and a certain amount of experience is absolutely necessary,—the sort of experience that one gets from the examination of cases in the general hospital, such as Dr. Thompson has in his examinations in the wards of the Boston City Hospital. For instance, I see a great many cases each year at the Massachusetts General Hospital where there are these slight changes, and those cases mostly are of cardio-renal disease,—cases where the prognosis is not so absolutely unfavorable as in those instances where you find a very definite retinitis. I think the ophthalmologist can do a great deal in the routine fundus examination of people as they come for glasses between the ages of forty and sixty, and can very often spot a lesion in the vessels and send the patient around to the general practitioner. Very often in that way quite a number of useful years can be added to the patient's life, by discovering the lesion earlier than it would be discovered otherwise.

REMARKS ON BLOOD-PRESSURE.

Dr. G. V. N. Dearborn, Cambridge: Mr. Chairman, and ladies and gentlemen: In the course of uncompleted observations on the relations of the mental process to blood-pressure (which has been my chief and particular form of research for two or three years), I came to a knowledge of the extremely wide variations in the blood-pressure,—both diastolic and systolic, and in both children and adults,—which I am sure is of practical application and of practical use to the average clinician. I have here about 140 graphs made from relatively continuous records of blood-pressure, each from two minutes up to about one hundred minutes in length (one hour and three-quarters)—something, I think, which has not been done before. These are the originals, and I pass them around, for I would like to have you see what they are like; I am sorry that I cannot circulate them in some sort of regularity, or in order.

The best I can do, of course, in my brief allowance of time, is to suggest very summarily indeed some of the clinical conclusions which I think would be of the most practical interest to you. The first thing I want to point out is that there are always at least six or seven uncertainties in every blood-pressure determination. The first one (most commonly overlooked) is *the muscular tension of the arm.* The arm, of course, is actually not a fluid. Theoretically for blood-pressure tests it is a "perfect fluid," but in reality it is not so, and any increase in the tonus of the muscles certainly changes the blood-pressure. The second uncertainty is the *varying tension of the artery,* an element which has been sometimes overlooked. The artery, in order to be relatively incompressible, does not have to be sclerosed; it may be merely vasoconstricted. Of course you have a continually decreasing resistance to your decompression as the artery becomes less and less constricted. Third, is *the shape of a cross-section* of the artery. When it is a round tube it is obviously a series of arches, but as the artery collapses these become broken arches, and of course these are very weak as structural units. The fourth element that is to be taken into consideration is the *training-index* of the patient, whether the patient be a physically trained individual or not, and particularly whether he has had very recent exercise or not. A physician recently told me about a layman who went up in a high office building in New York City to have his blood-pressure measured and to take the remainder of a life-insurance examination. The elevator was not running and he walked up four or five flights of stairs in a hurry and excitedly. On the basis of his blood-pressure he was "rejected." The *excitement-index* of the patient necessarily comes into all these cases and is an important unknown factor until determined. The *mental activity* of the patient is a factor,—whether he is emotional or not, whether he is thinking or not, and so on. Then, occasionally I have found in the 4,800 measurements of blood-pressure which I have made in the last three years a distinct *dilator spasm* (*or else atony*) of the artery, something which, so far as I know, has not been described, but which immediately "throws out," *i.e.,* stops, all of the Korotkoff sounds which you have to hear in determining the arterial tension. The artery certainly "has a habit" under conditions to be determined, of suddenly expanding, and thus losing all the sounds. There is finally a *vasomotor neurosis,* not the "hypertonia vasorum idiopathica" that you find described in some of the text-books, but a distinct neurosis of the immediate vasomotor apparatus which gives rise to long-continued high blood-pressures. For instance, a worried man of sixty-five had his pressure consistently up to 260 two or three years ago; he had no discoverable lesions in the kidneys or in any other organs whatever; he is now down to a reasonable blood-pressure for that age. I think we must be expecting soon the neurologic description of a vasomotor neurosis, one might almost call it a psychosis, which raises blood-pressure far above the danger sign, for example, in interstitial nephritis.

Now, there are certain practical and clinical deductions which I venture to make from these 140 "continuous" graphs which are in your hands. I have divided them into nine groups, and when the research-report is properly prepared they probably will be set forth in that manner. In Group A, there are those curves which show an enormous initial variation from day to day, sometimes as much as thirty millimeters with no apparent cause whatever except recondite physiological conditions, which seldom have been taken into consideration. Group B shows a large and progressive fall from the first taking for 15 or 20 minutes. The average physician over the land does not realize, when he finds a patient's pressure a little higher than he thinks it ought to be, that perhaps 20 minutes later it may be 30 or 40 millimeters lower. One of these graphs shows 34 millimeters progressive physiological fall within 15 minutes in a normal individual under the quietest conditions.

Voluntary relaxation plotted in Group E is something I wish to call to your attention simply as a matter of expediency in insurance-examinations. A physician in a neighboring town voluntarily relaxed his muscles and in that way, as you see, reduced his blood-pressure, and then raised it by holding his breath, so that there was within 15 minutes a voluntary rise of 119 millimeters. First, he deliberately lowered his pressure (systolic) about 24 millimeters, and then he raised it to 230, a voluntary variation of 119 millimeters within 15 minutes, down and up. Anyone that understood the trick could do that in the course of a life-insurance examination, and no one the wiser, under present methods of using the gauge.

Normal variation is enormously large, as Group F shows. The most marked graph which I have had showed a wholly spontaneous variation up and down of approximately 40 millimeters within five minutes. This was a woman of about fifty-nine, a normal person, but a nervous woman with "a New England conscience," as Professor Putnam says, a woman whose autonomy is undoubtedly easily affected by emotional and intellectual stimuli.

Anesthetics (Group J) have characteristic blood-pressures. Mental defectives (Group H), the so-called feeble-minded, also have characteristic blood-pressures, into the nature of which we cannot now go.

I wish to suggest that the diastolic pressure is only a little less variable than the systolic. One medical gentleman, again, said, "We never pay much attention to the blood-pressure of children anyhow." But my records, graphs, show that blood-pressure is almost as variable in adults as it is in children, and often more so.

I wish, then, to suggest as theoretic corollaries, that in the first place the physiologists should study vasomotion, and study it extensively. We must investigate the physics of the arm. We must understand the mental influences.

And then there are five practical corollaries: In the first place, *use twenty minutes instead of one in "taking a blood pressure,"* both diastolic and systolic; use twenty minutes instead of one, and take both the readings every minute, or at least every two minutes. I see one clinician smiling at that, but it is either that, ladies and gentlemen, or else a doubtful report; either fifteen or twenty minutes, or a misleading notion of that individual's real, effective blood-pressure. Second, *interpret no reading, save as the algebraic balance of two dozen or more factors and modifiers.* Third, *don't scare the patients,* unless you have some personal reason for taking too high a blood-pressure. Fourth, *the pressure in the brain and in the autonomic centers is more important than the pressure in the arm;* and we need a method of finding the pressure in these former places. And, fifth, there is probably a frequent neurosis, *a well-defined "middle-age" vasomotor neurosis,* which raises the blood-pressure without indicating anything of broad prognostic significance so far as we at present know.

DR. H. D. ARNOLD, Boston: The papers have been presented so ably that there is little room for discussion. I would like to say just a word, however, in reply to Dr. Frothingham's challenge,—that probably the rest of us wouldn't agree with him in abandoning the use of the term, "chronic interstitial nephritis."

It seems to me that perhaps it is better to "bear those ills we have than fly to others that we know not of," particularly as one of the really disappointing conditions in our present study of nephritis is the failure of the pathologist to correlate the pathological evidence with our clinical experience. Dr. Frothingham's suggestion of "chronic vascular nephritis" in place of "chronic interstitial nephritis" is valuable, I believe, for a considerable number of cases; but until we know the subject a little more thoroughly and know how far that term, "chronic vascular nephritis," would be a really proper term for our cases, I believe we should be no better off than we are with the present term,—recognizing that the present term is unsatisfactory.

A very interesting thing to me in studying the cases clinically, which are ordinarily classed under the head of chronic interstitial nephritis, is to find a class of cases in which regulation of the diet seems to be followed by a very definite reduction in the blood-pressure. In these cases the natural interpretation seems to be that when you get the demand for elimination down to the capacity of the kidneys you have relieved a condition which is a factor in the high pressure.

Now, there is a class of cases in which the blood-pressure is only slightly, if at all, affected by dietary treatment; and it seems to me that in those cases at least the high pressure is very likely a compensatory measure. In some of these cases which I have studied by the functional tests, it has been shown that the vascular system is much more concerned in the process than are the renal elements proper. I believe we are going to recognize clinically, as we go on, different sub-divisions of what we now call chronic interstitial nephritis, and that one of these sub-divisions will be these cases where hypersensitiveness of the vascular system is a determining factor. I am wondering whether "chronic vascular nephritis" is not a term to be reserved for this sub-division, rather than to be applied to all cases which we now class as chronic interstitial nephritis.

Original Articles.

THE PHYSIOLOGICAL POINT OF VIEW AND AUTOPSIES.

BY FRANCIS H. MCCRUDDEN, M.D., BOSTON,

Laboratory Director, Robert B. Brigham Hospital.

THE usefulness of a point of view once established, the problem arises of extending its influence. At the Robert B. Brigham Hospital where we are demonstrating to physicians,[1] students,[2] patients, and others, the usefulness of the physiological point of view of the problem of treatment in chronic disease, it is evident that the patients appreciate its usefulness.[3]

From the large proportion of cases of death in which permission for autopsy is obtained, it has become evident that our ideas are spreading to the relatives of the patients.

Since the hospital opened on April 1, 1916, complete autopsies have been carried out on 70% of all those dying (35 autopsies in 50 deaths). The figure for 1914 is 74% (14 cases out of 19 deaths); that for 1916 so far (May 1) 100%. No other American hospital has attained results that at all approach these.

The figures which follow, taken from a report in *The Modern Hospital*,[*] show the best results in other American hospitals:

	PER CENT.
Robert Breck Brigham Hospital, Boston	70.0
Peter Bent Brigham Hospital, Boston	58.5
University of California Hospital, San Francisco	56.8
Presbyterian Hospital, New York	24.8
New York Hospital, New York	20.6
Boston City Hospital, Boston	14.7
St. Luke's Hospital, New York	14.4
Bellevue Hospital, New York	11.8
Mount Sinai Hospital, New York	7.3

(During one year Johns Hopkins Hospital performed autopsies in 62.5 per cent. of the deaths.)

An examination of the reasons for the difference in the figures would show, of course, that many factors are involved; but in the last analysis success depends on the degree to which the relatives can be made to appreciate what has been done to help the deceased, and the extent to which they can be made to understand that in giving permission for a post-mortem examination they may be contributing something toward helping other patients; the extent, in other words, to which they catch the hopeful spirit of our physiological point of view.

The figures bring out one other point, namely, that the emphasis laid on the physiological point of view need not lead to any neglect of pathological anatomy; in our hospital the direct result has been, on the contrary, an increase in the possibilities for pathological-anatomical studies.

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Clinical Department.

CORSETS VERSUS BACKACHE AND FATIGUE.

By Alice S. Cutler, M.D., Westborough, Mass.

Westborough State Hospital, Westborough, Mass.

The subject of corsets may not be an interesting one; but to me, as a woman physician (being on the staff of one of the large state hospitals) who has examined over a thousand women vaginally during the last five years, it has been instructive in showing me that the majority of women suffer from the ill effects of bad corseting.

I heartily agree with Dr. Robert L. Dickinson of New York, who has made the following statement: "Many feminine ills are due to incorrect corseting and defective corsets."

For two years I have been experimenting with corsets, on patients, nurses, and my home friends. The idea was put into my head from pelvic conditions found in a physician's wife, who suffered from severe backaches and fatigue. (She had been advised by a number of physicians to have a ventral fixation.) A vaginal examination showed a retroversion of the uterus which was freely movable. While she was dressing, I observed the way she put on her corsets, and asked her to lie down on the examination table with them on—where before the uterus was freely movable, this time I could not lift it up without causing her great pain and discomfort. I advised her to buy a pair of front-laced corsets, which she did the next day. I showed her how to put them on lying down (with a pillow placed under the buttocks). I examined her again with these corsets on and found no displacement. She has made the statement a number of times that she never felt better; has no backaches, nor does she suffer with fatigue when she has to be on her feet a great deal. She plays tennis, dances, and does everything that a normal, healthy woman ought to be able to do, but cannot.

After my experience with the physician's wife I began working with women patients, nurses and employees. In over four hundred women, I found a backward displacement caused by the ordinary back-laced corset, put on incorrectly as most women fasten them together. With the nurses and employees who have changed from the back to the front-laced corset, there is complete satisfaction; they have all told me that at the end of their day's work they felt fresh enough to dance all night.

I know from my own personal experience that, since I began to wear front-laced corsets, I feel like a different person; where, a number of years ago, I was easily exhausted after working a few hours, now I do not know what fatigue is.

To cite a few cases:

Case 1. Two young women in my home town (ages eighteen and twenty-one) thought they had to give up playing tennis, thinking the exercise too strenuous, because they suffered from severe backaches and pain in the lower part of the abdomen after this exercise. When they were fitted to front-laced corsets they both became enthusiastic, for they felt they could run all day without a symptom of a backache or abdominal pain.

Case 2. Last summer one of our nurses wanted to enter a dancing contest, but was afraid she could not stand the physical strain, knowing that she easily "lost her wind." Front-laced corsets gave her confidence and allowed her to breathe in a normal manner. She and her partner won a prize.

Case 3. A large, obese woman of fifty, with pendulous abdomen and breasts, while walking from the gate to the main building (up a slight incline, a distance of two hundred feet) became dizzy. She came into the office and made the following statement to me, "I feel that something serious is going to happen." We went into the examining room, I took her systolic blood pressure and found it to be 186. Her face was scarlet, her feet and hands cold and clammy, heart action rapid and tumultuous. I helped her to undress; instead of unhooking the corset I cut the laces (in the back). The way the corsets were put on showed why she had marked dyspnea. I felt that her whole trouble was due to the corsets, and told her to buy a pair of front-laced corsets. In her case I had her put them on lying down, with hips elevated. This woman has been made so comfortable by being able to breathe and by not becoming dizzy when she walks, that she feels I have done her a great favor by demonstrating that the trouble was due to her corsets. Her blood pressure at the present time is 155.

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[*] Autopsies Increased in Number, *The Modern Hospital*, p. 187, March, 1916.

I could cite cases indefinitely of the new lease of life given to women by wearing a properly fitted front-laced corset. I really hope this article will be the means of stirring up the medical profession to question their women patients about corsets; for women have made the complaint to me that their family doctors never ask them what kind of corsets they wear, and they are also surprised that corsets make such a difference in their own personal health.

Society Reports.

CLINICAL CONFERENCE OF THE NEUROLOGICAL INSTITUTE, NEW YORK.

Regular Meeting, March 14, 1916.

J. Ramsay Hunt, M.D., in the Chair.

MYASTHENIA GRAVIS IN A CHILD OF EIGHT YEARS.

Dr. J. W. Stephenson presented from the Second Division a girl 8 years of age, Hebrew. She is the youngest of three children, the others being in good health. It is said that her father's blood serum showed a four plus Wassermann. She was healthy until she was 9 months old, when she was vaccinated. Following this she is said to have developed blood poisoning. Her arm was swollen, she had a high fever, etc. Soon thereafter her mother noticed that the eyelids would occasionally droop, and then as the child began to walk it was noticed that she would tire easily. These two symptoms have persisted with remissions and are the two symptoms for which relief is sought. The mother's story is that the child wakes in the morning with eyes wide open, but after she has been about for two or three hours, the eyelids begin to droop and she complains of tiring, in fact has to sit down in order to become rested. She cannot walk more than three or four blocks without tiring.

Examination revealed a well-nourished girl, showing a double ptosis. There were no marks of degeneracy, no atrophies, no sensory disturbances. No evidence of persistent thymus. Blood pressure, 90. Pupillary reaction normal. Eye mobility in all directions upon first examination showed a decided weakness, and upon repeated examination the patient was unable to perform any movements of the external muscles of the eyes. In other words, she showed a complete ophthalmoplegia externa. The child was allowed to rest in a recumbent posture, eyes closed, for a half hour, after which the ptosis disappeared, and eye movements, though not making a complete excursion, showed a definite amount of power. After putting the child through various tests for about five minutes, the phenomena mentioned above reappeared. There was no involvement of the muscles of deglutition or mastication. The knee jerks were lively, but upon frequent percussion became less active, but never entirely disappeared. The plantar responses were flexor and there was no alteration of the abdominal reflexes. Serological investigations of blood and spinal fluid were negative. The electrical reactions by Dr. Rochfort were as follows:

"The response of all the facial muscles is considerably reduced to faradism, particularly in the orbicularis oculi and occipito-frontalis. When these muscles are repeatedly stimulated, three times per second, the muscles soon show sign of fatigue. The response gradually becomes slower and less forcible, and finally after about 80-90 contractions disappear in the occipital portion. After a rest of two seconds the contraction is again about as vigorous as at the beginning. This phenomenon is doubtless a typical myasthenic reaction."

In concluding the presentation, Dr. Stephenson stated that the ophthalmoplegia externa with ptosis could be explained by the existence of polioencephalitis superior, bilateral disease of the quadrigeminal bodies, or myasthenia gravis; but the variable course of the disease, and the definite myasthenic reaction, proved conclusively that the patient was suffering from myasthenia gravis, the interesting features being age of onset, viz: first year of life; the four plus Wassermann in the father, and the fact that the condition followed a severe infection. The latter two conditions he considered, if followed up, might throw some light on the etiology of the disease, which as yet has to be fully explained. He also stated that, to his knowledge, the patient was the youngest case of myasthenia gravis on record.

A CASE OF BRACHIAL PLEXUS PARALYSIS.

Dr. Edwin G. Zabriskie presented from the First Division a girl of 17 years, single; occupation, a demonstrator of sheet music. Her family history is negative; both parents are living and well. She has two brothers and two sisters, all living and well. As far as can be determined, her infancy and her early childhood up to her seventh year were uneventful. At the age of seven she had an attack, which was characterized by swelling and pain in the arms and legs. She is uncertain whether it was confined to the joints or to the muscles. She was laid up in bed six weeks. She made, however, an uneventful recovery, but about six months later her left hand began to shake in the manner of a fine rhythmical tremor, which was somewhat increased by emotion. While rubbing the hand with a lotion, her mother noticed that the outer surface of the dorsum of the left hand was becoming thinner, and she says there was a marked tenderness and some pain along the last two interossei. About the same time she noticed that she was losing the power to extend fully the little and ring fingers of this hand, and that they were becoming slightly bent. After a few months the pain and tenderness ceased, but she never regained the power to stretch out those two fingers, and the flattening of the hand at that point always persisted. She was always able to straighten them by using her other hand, and this process never caused any pain in the palm. When she was 13 years old she was shot in the right eye, and as a result of this she lost the sight completely in that eye; the right globe has also become fixed, and coincidentally she developed a paralysis of the left external rectus, which has also persisted. She at the age of 12 began to study music, and until a short time ago has been able to earn her own living at this occupation. About 1½ years ago, from no cause that can be ascertained, she developed pain in the left hand extending up the arm as far as the shoulder, which she described as a dull tearing pain something like a toothache. At the same time she began to notice a further atrophy of the entire hand, and it has gradually become weaker, more powerless, until at present she is unable to use it for anything requiring the least amount of power; for instance, she is unable to steady her meat with a fork, while she cuts it.

Status praestans. Delicately built young woman, whose physical state, except for the condition of her eyes and left arm, is normal. There is double abducens paralysis and right phthisis bulbi. The entire left arm is much smaller than the right and averages 3.5% less in circumference. The greatest amount of atrophy is in the thenar, hypothenar and interosseous muscles. All movements of the arm and forearm are possible, but the gross muscular power is greatly reduced. Flexion, extension, adduction and abduction of the hand are reduced to a minimum, and she is unable to perform these motions against the least resistance. Movements of the fingers are restricted to slight flexion of the thumb by means of the flexor longus pollicis; extension of the thumb by means of the long extensor, flexion and extension of the little and ring fingers, adduction and abduction of all the fingers are abolished. Sensation is normal in the upper arm and radial distribution of the forearm and hand. The cutaneous distribution of the ulnar nerve shows a distinct hypesthesia for all forms of sensation. For a distance of about 1½ inches above the wrist it is well marked, but above this joint it diminishes in intensity until it is quite indefinite at the elbow. The electrical responses are diminished but there is no qualitative alteration.

Radiograph of the neck reveals no abnormality of the bony structures, but on palpation, a small rounded mass can be felt just beneath the lower insertion of the left sternocleido mastoid. Pressure on this mass causes a shock-like pain referred to the inner aspect of the forearm and the little and ring fingers. Unfortunately, exploratory operation was refused, and it became, therefore, impossible to demonstrate this mass as the pathogenic factor.

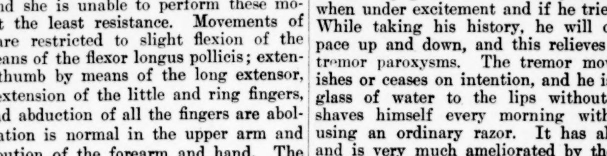
PARALYSIS AGITANS WITHOUT RIGIDITY.

Dr. J. Ramsay Hunt presented from the Third Division a case of generalized tremor of the Paralysis Agitans type, unassociated with the muscular rigidity which usually accompanies this disease.

The patient was a man thirty years of age, of Irish extraction, a laborer by occupation. He was admitted to the Neurological Institute on February 1, 1916, and gave the following history.

There is no familial tendency to tremor or other nervous disease. He is moderate in the use of alcohol and tobacco. Eight years ago he acquired syphilis and received three years' continuous treatment with mercury by hypodermic injection, potassium iodide, and five full intravenous injections of salvarsan at intervals of three weeks. He states that coincident with the chancre there was a moderate jaundice, which was transitory in character. He has had no shock or injuries, and is unable to assign any cause for the tremor, which first made its appearance three and a half years ago in the right hand. It gradually progressed, involving the entire right upper extremity, and two years later appeared in the lower extremities. During the past year, when the tremor is severe there is also a difficulty in articulation. The left arm is also slightly involved, but in a much less degree. The tremor is slow, coarse and rhythmical, ranging from four to five vibrations a second. It is very much exaggerated by mental excitement and by observation. He states that on awakening in the morning he is comparatively free, at times totally free, from tremor. It makes its appearance after he is up two or three hours and lasts during the day, usually progressing as the day goes on. It is very coarse and violent when under excitement and if he tries to control it. While taking his history, he will often rise and pace up and down, and this relieves somewhat the tremor paroxysms. The tremor movement diminishes or ceases on intention, and he is able to lift a glass of water to the lips without spilling, and shaves himself every morning without difficulty, using an ordinary razor. It has also diminished and is very much ameliorated by the use of hyoscine. Since the onset of the tremor there is a marked tendency to hyperidrosis. He perspires very freely, and this manifestation is generalized, and not confined to any one extremity. There are no pains, no paraesthesias, and during his sleep all movements cease. The tremor is not relieved by taking alcohol.

A careful neurological examination reveals the following symptoms: There is infrequent winking, this reflex taking place only at long intervals of one, two and three minutes. The posture, manner of holding the arms and hands, the expression of the face, are very suggestive of Parkinson's disease. There is no well-defined Parkinsonian mask, but the face lacks a certain mobility of expression. The positions of the tremulous hands, however, especially the right, are quite typical. In walking, he holds the right arm stiffly and to a lesser extent the



SPECIMEN OF HANDWRITING, SHOWING TREMOR.

left, and they do not partake in the natural associated movements which accompany this act. There is absolutely no rigidity of the muscles. The (cogwheel) symptom, on making passive movements of the upper extremities, is suggested, but not characteristic of the Parkinson's disease. While there is no hypertonicity of the muscles, on the other hand there is no hypotonia, and the bodies of the muscles stand out quite firmly under the skin. There is no loss of power. The tendon reflexes of both the upper and lower extremities are normal and equal on the two sides. The pupils are equal and react to light and accommodation, and the cranial nerves are negative. The outline of the optic discs is clear and there is no evidence of neuritis. All of the skin reflexes, including the plantar, cremasterics, abdominal and sympathetic reflexes are present and normal. There is no disturbance of the objective sensibility. The visceral examination is negative, save for a left inguinal hernia. The speech shows a slightly tremulous character but is otherwise normal. Special senses are undisturbed. The urine is negative and the Wassermann examination of the blood and cerebrospinal fluid is also negative. There is no pleocytosis.

Remarks.—The case is regarded as an example of paralysis agitans without rigidity. This tremor form of Parkinson's disease is quite rare, and is by no means as common as the other incomplete type, namely, paralysis agitans without tremor. The diagnosis is based on the paralysis agitans type of the tremor; its cessation during rest, occurrence during activity; the synchronous, vibratory character of the tremor, which has the same rhythm in all the extremities. It can be inhibited by the will, but reappears in other parts of the body during the act of inhibition. Other additional signs indicating a Parkinson's disease are: the infrequent winking, the posture of the hands, the expression of the face, and the absence of associated movements of the arms in walking. It was thought that an *essential tremor* could be excluded because of the absence of the familial history, the unilateral onset in the right upper extremity and the Parkinsonian characteristics of the movements. The *chronic progressive cerebellar tremor* was also excluded because of the absence of any increase of the tremor movement on intention, as well as the absence of cerebellar elements, such as dysmetria, dyssynergia, intermittent asthenia, and hypotonia which are associated with this disease.

Paralysis agitans may occur as a presenile or juvenile affection, and in a symptomatic form. It may appear without tremor (paralysis agitans *sine agitatione*), and, as in this case, it may appear without rigidity, this latter form being by far the rarest type of the affection. Similar cases have been described by Kurt Mendel, Oppenheim, and O. Foerster.

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Book Review.

Practical Physiological Chemistry. A Book Designed for Use in Courses in Practical Physiological Chemistry in Schools of Medicine and of Science. By Philip B. Hawk, M.S., Ph.D., Professor of Physiological Chemistry and Toxicology in the Jefferson Medical College of Philadelphia. Fifth edition, revised and enlarged. With two full-page plates of absorption spectra in colors, four additional full-page color plates and 172 figures, of which 12 are in colors. Philadelphia: P. Blakiston's Son and Company. 1916. Price, $2.50 net.

The author presents us with the fifth edition of his well-known work on physiological chemistry, which is made to include all the newer tests, and, in fact, is absolutely up to date. It is profusely illustrated, and the micro-photographs of the rarer products, such as aspartic acid, glutamic acid, proline, etc., must be of great assistance for verification to the investigator who is isolating these substances. It contains both classifications of proteins, adopted by the American and the English scientific societies, which differ somewhat in their grouping.

All the directions given for the isolation of various products and their identification are very complete, and while to the trained chemist must seem somewhat superfluous, will naturally be of enormous assistance to students, for whom the book is primarily written. The chapter on nucleic acid and nucleoproteins contains all of the latest results of the various investigators who have been searching this previously little known field, and can be read with profit by clinicians who can naturally trace back uric acid to its origin. In the demonstration of the presence of uricase, no cautions are introduced against the overuse of potassium hydroxide, which, as is well known, will produce the same effects as the enzyme which is being studied.

That portion of the book which is devoted to gastric digestion and analysis is very complete, and the fractional method of removal of the gastric contents from the stomach, which has been so carefully investigated by the author and his students, has been given full attention. In the chapter on feces, as is usual, the greater amount of attention is given to microscopic examination and quantitative determination, employed not for clinical purposes, but for studies in metabolism. The chapter on blood analysis contains all the newer methods of quantitative determination of urea, uric acid, sugar and creatinin in the blood, which have so largely replaced the measurement of these elements in the urine. The chapter on urine leaves nothing to be desired in its completeness and the thoroughness with which all tests and their value are given. A well-arranged table of reagents needed in the various tests employed in the book is given at the close. On the whole, this work has not only maintained its previous reputation, but has added new laurels.

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Hugh Williams, M.D., Boston.
Alfred Worcester, M.D., Waltham.

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Ernest Gregory, *Manager*,
126 Massachusetts Ave., Corner Boylston St., Boston, Massachusetts.

THE EPIDEMICS OF POLIOMYELITIS.

The epidemics of poliomyelitis in New York and Massachusetts have continued to extend during the past week. On July 25 the total number of cases in New York City amounted to 3098, and the deaths to 647. In New York State, outside the city, there was on July 29, a total of 380 cases and 39 deaths. It is announced by the State Health Department that three new temporary laboratories are to be established to aid in combating the disease. At Poughkeepsie, N. Y., and in its suburb of Arlington, there had been, on July 25, 13 cases and five deaths, and it is believed that the reopening of Vassar College will be forbidden until the epidemic is at an end. At Oyster Bay, L. I., an investigation of sanitary conditions has been made by a local committee of citizens. Four cases have already occurred in this town. More rigid quarantine measures have been instituted in New York City, and no child under 16 is now allowed to leave the city without medical inspection, a fortnight's quarantine and a health certificate issued by the federal authorities. In addition to the federal officials whose names were noted in last week's issue of the Journal, as being in charge of the work in New York, the following surgeons of the United States Public Health Service were ordered to that city on July 21: Dr. W. J. Tettus, Dr. H. W. Witkes, Dr. D. E. Robinson, Dr. R. A. Herring, P. C. Kalloch, Dr. R. A. Kearney, and Dr. L. O. Weldon.

In Massachusetts the total number of cases on July 30 amounted to 95. Of these, there were eleven each in Westfield, North Adams, New Bedford and Worcester, and 9 in Boston. New foci of the disease have developed at Adams, Fitchburg, Barnstable, Hingham, Quincy, Revere and Taunton. The condition at Westfield is apparently the most serious, since the proportion of cases here to the total population is nearly as large as in New York City. Parents throughout the State have been warned by the Health Department not to take their children to either Westfield or North Adams.

In New England, outside of Massachusetts, there have now been in Connecticut, 118 cases, of which 19 were in New Haven, 12 in Bridgeport, and four in Derby. There have been three deaths from the disease in Bridgeport, two in Meriden, and one each at Windsor Locks and Milford. In Rhode Island there have been 25 cases, of which eight have been in Providence. On July 28 two cases were reported in Keene, N. H.

Outside New England, the largest focus of the disease is in Illinois, where on July 24 the total number of cases reached 73, with three deaths. Twenty of these cases were in Chicago. In Iowa there have been 14 cases and three deaths. From Elizabeth, N. J., was reported on July 24, one of the first adult deaths from the bulbar type of the disease.

In the weekly report of the United States Public Health Service for July 14, 1916, was presented a complete tabulated statement of the prevalence of the disease throughout the country on that date, but these figures have since been so rapidly modified as to be of little present interest. In the same issue is an admirable summary by Dr. Wade H. Frost of what is known of the cause of the disease, the means of its transmission, and its epidemiological characteristics. Dr. Frost concludes that, on the whole, the experimental evidence taken alone, while not excluding other means of transmission, points to the conclusion that poliomyelitis is a contagious disease spread from person to person through interchange of infectious secretions, the sources of infection being the clinically definite and clinically indefinite acute cases of poliomyelitis, convalescents, and passive human carriers.

In the weekly bulletin of the Health Department of the City of New York for July 8, is published a valuable statement describing atypical forms of anterior poliomyelitis and the use of lumbar puncture in their diagnosis. As a rule, poliomyelitis is regarded by the laity and by physicians alike as an acute disease, characterized by the early appearance of a more or less extensive flaccid paralysis. It has, however, widely varied manifestations. Wickman has classified the disease under eight types: 1, spinal poliomyelitic; 2, Landry's; 3, bulbar or pontine; 4, encephalitic; 5, ataxic; 6, polyneuritic; 7, meningitic; 8, abortive. The simpler classification of Peabody, Draper and Dochez, from the Rockefeller Institute, recognizes three types: 1, abortive cases without paralysis; 2, cerebral cases with spastic paralysis; 3, bulbo-spinal cases. Wickman considers that from 25 to 56% of the cases are abortive. These cases are likely to escape recognition and are, therefore, most important in their relation to public health, from their likelihood of spreading infection. The symptomatology of this group of cases is further discussed in the *Bulletin* as follows:

"The initial symptoms are very like those of the paralytic cases: fever, hyperesthesia, drowsiness, headache, vomiting, varying degrees of stiffness of the neck, Kernig, positive Macewen. Seen during the first twenty-four or thirty-six hours, the diagnosis from epidemic meningitis can be made in no way except by lumbar puncture, and even this is sometimes confusing by the microscopic examination, as the fluid at this stage may be slightly turbid. The diagnosis from other acute infections of childhood depends to some extent on the greater degree of hyperesthesia and also on the examination of the spinal fluid, which in meningism, with other diseases, is normal. Recovery may take place in a few days. No diagnosis may be made unless expert consultation is obtained early. On the other hand, the symptoms may run on for two or three weeks. There often develop loss, diminution or inequality of the knee jerks and loss of the pupillary reflexes. At this stage the differential diagnosis from tuberculous meningitis is very difficult, and lumbar puncture, while helpful, is by no means positive, the fluids in the two conditions being often very similar. In many cases there is a varying degree of weakness, often transient, and slight facial palsies are frequent. These abortive cases very evidently constitute the most dangerous foci for the dissemination of the disease.

"A very unusual manifestation of poliomyelitis is blindness. The Meningitis Division of the Department of Health has seen two such cases, one being in the present epidemic. In the first case, the vision was restored at the end of about three months. The second was a quite recent case and the blindness still persists. Cases with the bulbar type of paralysis, with difficulty in speaking and swallowing, are not uncommon in this epidemic and have, in some instances, been diagnosed as croup. In a fairly large number of cases, a rapidly ascending type of paralysis has been present, involving the muscles of respiration and ending with death. Some of these, when seen late, after pulmonary edema has developed, have been diagnosed as bronchopneumonia. The fatalities of the present epidemic have been largely due to these two types of the disease.

"The spinal fluid in poliomyelitis is usually clear and increased in amount. The albumen and globulin are increased in varying degrees, and there is usually a good reduction of Fehling's. The cellular increase ranges from slightly above normal to over 900 cells per cubic centimeter. Early in the disease the cells may be 50% or more polymorphonuclears. Later there are usually 90% or more mononuclears. There are frequently large mononuclear cells that seem somewhat characteristic of these fluids.

"Two rather unusual varieties of fluid are sometimes seen, probably the result of an extremely pronounced hemorrhagic condition. In one type the blood is evidently fresh, and is uniformly admixed with the spinal fluid, thereby differentiating it from blood obtained from the accidental puncture of a vein. Evidence of an older hemorrhage occurs in the second type, which presents a yellow fluid, coagulating spontaneously."

From July 5 to 8 a convention of Vermont health officers, held at Burlington, Vt., was devoted particularly to a discussion of poliomyelitis, upon which special research has been conducted at the University of Vermont College of Medicine. Papers were presented by Drs. Harold L. Amoss of the Rockefeller Institute and Robert W. Lovett of Boston. Since the epidemic of 1914, the disease has largely disappeared from Vermont, and in the effort to prevent its reintroduction, the State has established a rigid quarantine exclusion against persons coming from New York City. Previous epidemics of poliomyelitis in the United States have been recorded; in Louisiana in 1841, and in other parts of the country in 1880, 1884, 1885, 1889, 1890, 1895, 1899, 1905, 1907, and 1912. Between 1905 and 1909 there were 8054 cases in the United States, representing five-sevenths of all the reported cases in the world during that quinquennium. In 1907, there were 2500 cases in New York, and in 1910, 1000 cases in the United States. The most serious previous epidemics in Massachusetts were in 1907 and 1912.

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CENTRAL CONTROL OF TUBERCULOSIS.

The prevention of tuberculosis is so large a problem in preventive medicine that the considerations surrounding it can no longer be individual ones, but only central or communal. Public campaigns against tuberculosis have their chief value in guiding the public in their demands for the betterment of those conditions which are known to be such prolific causes of tuberculosis. Individual considerations and individual methods of care and prevention are factors in the general problem only in a comparatively small degree; and there can be very little feeling of security even in the knowledge that the lessons of prevention had been brought home to the conscientious individual. The carrying out of preventive measures by the individual depends for its efficacy upon the always variable and intangible will and comprehension of the points involved. Usually, however, those whom it is desired to reach most are quite out of reach because of general ignorance and low scale. For this reason every comprehensive investigation points to the community in its police capacity as the center from which changes must emanate if this problem is to be solved. Conditions must be so changed in the community that the personal factor will be a negligible element. The changes enforced must be in the industries—along sanitary lines, in better housing, in general cleanliness, raising of economic conditions, restriction of the drug and alcoholic consumption, central notification of all cases, better care of incipient cases and so forth. To be sure these measures require the individual coöperation, but the enforcement must be central.

In an exhaustive survey by Robinson and Wilson (*Public Health Bulletin, No.* 73) of conditions probably concerned in causing the unusually high incidence of tuberculosis in the city of Cincinnati, they found that in respect to the many industries located therein, there were no causes inherent in the occupations which helped in this increase, but that there were a great many deleterious factory influences, all remediable, to which this increase could be in part traced. Of the cases of tuberculosis found in the industries about 19.05 per cent. could be ascribed to one or another deleterious factory influence. These influences included insufficient space, insufficient toilet, washing, lighting and other facilities. The one prominent working element which seemed such a pertinent factor in the development of tuberculosis was the speeding up demanded in certain occupations. However, in 62 per cent. of the cases found in the industries there was a distinct hereditary factor, and about 19 per cent. of the cases were traceable to poor housing conditions. The hereditary element and the housing element are not distinctly separable, but overlap each other. A very large part of the apparently hereditary element is a housing one, in which the poor housing is the direct cause of the subsequent as well as the primary cases. The hereditary cases are really infections from the same source.

It is a significant fact that as much as 13 per cent. of the cases can be directly attributed to alcoholic excess; in spite of the still very popular belief that alcohol is curative, and not provocative of tuberculosis. Indeed, excesses of all kinds can be placed in this category. Abuse and excess, whether industrial or otherwise, as well as poor hygienic conditions, stand out prominently as causing tuberculosis in the individual and in the community. A community must make ample provisions for its growth and must curb abuses if it would maintain a high standard for health. It was found that in a city like Cincinnati where the growth of the city was rather slow, too slow to demand rapid and radical changes in its dwelling accommodations, as in a more rapidly growing city, and where as a result the excess population was accommodated in renovated but not enlarged building accommodations—where old buildings were made to accommodate more people than intended,—the rate of tuberculosis rose more rapidly than in cities where there was more congestion because of a more rapid growth.

WELFARE WORK AMONG INDUSTRIAL CORPORATIONS.

The August number of *The Modern Hospital* is published as a special issue, consisting of a symposium on welfare work among industrial corporations. The purpose of the issue is to provide valuable material for use by corporations in the way of first-aid study, emergency hospital, and welfare work.

The three phases into which welfare work is divided, or rather the three purposes for which it should be undertaken, are considered in this symposium to be as follows:

1. To make employees healthy, comfortable, and happy, in order that they may achieve the highest efficiency in their work.
2. To help employees prepare for the day when they are prevented from being bread winners, so that dependents on them may be provided for in case of sickness or disability.
3. To provide entertainment, recreation, and interesting groupings, in order that the employees of the corporation may have mutual interests which will enhance their loyalty and teamwork.

There are articles on various features of this work by Dr. Thomas Darlington, Dr. Samuel Lambert, Dr. S. S. Goldwater and many non-professional writers. In view of the prominence now being given to conditions of industrial welfare, this valuable special number of *The Modern Hospital* is particularly called to the attention of physicians.

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MEDICAL NOTES.

London Death Rates in May.—Statistics recently published show that the total death rate of London in May, 1916, was only 12.9 per thousand inhabitants living. Among the several districts and boroughs, the highest rate was 18.6 in Finsbury, a crowded central slum, and the lowest was 8.5 in Stoke Newington, an open suburb on the north.

Welsh National School of Medicine.—The foundation stone of the new buildings of the Welsh National School of Medicine at Cardiff was laid over a year ago by Lord Pontypridd. Sir William Thomas had given over £90,000 towards the completion of these buildings and over £250,000 more had been raised by Col. Vaughan. The war, however, has so far interfered with the project that further work on the buildings is indefinitely postponed. "This postponement," says a recent issue of the *Lancet*, "is naturally a source of keen regret and must cause anxiety to all who have at heart the cause of medical education and who view with dismay the probable shortage of medical men in the near future."

Prevalence of Malaria, Pellagra, Smallpox, and Typhoid.—The weekly report of the United States Public Health Service for July 14, 1916, states that during the month of May, there were in Arkansas, 390 cases of malaria, 62 of pellagra, and 22 of typhoid fever. In Kansas during the same period there were 230 cases of smallpox, and 56 of typhoid.

American Dental Association.—The twentieth annual meeting of the American Dental Association was held in Louisville, Ky., from July 24 to 27. At the second day's session, the subjects for special discussion were "the relation of mouth infections to general health and the importance of insuring prompt and permanent dental repair." Principal addresses were made by Dr. Thomas B. Hartzell of Minneapolis, Dr. John R. Callahan of Cincinnati and Dr. Weston A. Price of Cleveland. On July 27, Dr. L. L. Barber of Toledo was elected president, and Dr. Waldo L. Boardman of Boston a trustee for the ensuing year. The meeting of 1917 is to be held in New York City.

The Associated Out-Patient Clinics of the City of New York.—The formation of an association of out-patient clinics of New York and Brooklyn about three years ago was recorded in the Journal at that time with a statement of its aims which were:

1. The coördination of the work of existing dispensaries and out-patient clinics.
2. The elimination of unworthy applicants for treatment.
3. The promotion of proper standards of treatment.
4. The promotion of economy and efficiency in dispensary management.

On December 31, 1915, the membership of the Association numbered fifty-two clinics. The third annual report, for the year 1915, has recently been issued. The chief accomplishments stated therein are the establishment of two new sections of the Association, the Section of Surgical Clinics and the Section of Neurological Clinics. A statement of the required standard of a surgical clinic, prepared by that section, is given in detail and covers the equipment of a surgical clinic, the kind of patients to be treated in a surgical out-patient department, social service and visiting nursing and the history system. A similar standard has been drawn up by the Section of Neurological Clinics. Following a survey of the genito-urinary and syphilis clinics of Manhattan, additional suggestions were made to the already existing standard for clinics of that kind.

During the past year a chart, similar to the one published in the Second Annual Report, was prepared, showing the pathologic effects resulting from the inhalation of dust incident to a certain number of industries. The chart published last year in the annual report related to poisonous substances incident to industries in New York, but did not include dusts. The new chart was prepared by the executive secretary, and endorsed by Dr. W. Gilman Thompson, professor of medicine at Cornell University. The committee believes that the publication of this chart, in addition to the previous one, will be helpful to the clinics in the diagnosis of industrial diseases.

By the courtesy of the Division on Industrial Hygiene of the Department of Health, this chart will be published by the department, and the Association was requested to help the department in the distribution of this chart through the medium of the Annual Report.

EUROPEAN WAR NOTES.

PRIZE FOR MECHANICAL HAND APPARATUS.—A generous donor, who wishes to remain anonymous, has offered to the National Society of Surgery of Paris, a prize of 50,000 francs to be given to "the maker of the mechanical apparatus supplying the place of the hand best. All competitors must belong to allied or neutral nations. They are to present to the Society mutilated men who have been using their apparatus for at least six months. The Société de Chirurgie will experiment each apparatus on mutilated men for the length of time it thinks fit. The apparatus rewarded is to remain the property of its inventor. The competition will be closed two years after the end of the war."

MM. Faure, Kirmisson, Quénu, Rieffel and Rochard, who make up the committee elected by the Société de Chirurgie, inform the public of the condition of the competition as stated by the donor and beg any person wishing to compete to send his memoir and apparatus to M. le Secrétaire Général de la Société Nationale de Chirurgie, à Paris, 12, rue de Seine.

AMERICAN NURSES IN RUSSIA.—The work of enrolled graduate American Red Cross nurses in Russia is the subject of a letter from Mr. William Warfield, formerly an attaché of the American Embassy in Petrograd, and now chargé d'affaires for the United States in Sofia, Bulgaria, addressed to Miss Jane A. Delano, Chairman of the National Committee on Red Cross Nursing Service. The letter follows:

"While acting as an attaché of the Embassy in Petrograd, specially assigned to war relief work, I had occasion, as you know, to see a great deal of the members of the American Red Cross units in Russia. It gives me great pleasure to take advantage of this opportunity to say that the nurses attached to these units have been the greatest credit to the organization, and to the country they represent. Their professional efficiency is not only unquestioned but has excited a great deal of comment in medical circles, having been mentioned to me frequently by the Russian surgeons. Personally, by their devotion to duty and their splendid organization and discipline, these ladies have been a credit to American womanhood and its ideals. I do not hesitate to say that they have had an influence for good quite apart from mere professional services.

"I wish especially to express my appreciation of splendid work done by the group that worked largely under my personal supervision at Irkutsk. Their work there being non-professional in great part shows that the type of woman you are sending out is not only a good nurse but an all-round resourceful woman as well."

WAR RELIEF FUNDS.—On July 29 the totals of the principal New England relief funds for the European War reached the following amounts:

Belgian Fund	$139,778.15
French Wounded Fund	105,609.07
Serbian Fund	101,609.07
Armenian Fund	100,115.00
French Orphanage Fund	57,775.03
Surgical Dressings Fund	41,205.87
Belgian Tobacco Fund	32,433.40
Facial Hospital Fund	23,765.51
Italian Fund	21,102.84
Permanent Blind Fund	3,305.13

MEXICAN NOTES.

HOSPITAL NEEDS IN TEXAS.—The American Red Cross headquarters in Washington on July 25 received very interesting reports from its special agent in El Paso, Texas, Dr. Eugene A. Crockett, of Boston. After stating that very little has been received at El Paso in the way of gifts and comforts for the soldiers he says that as far as their serious material needs are concerned very little is required. Dr. Crockett says:

"I have now seen quite thoroughly the camps in the vicinity of El Paso, both regular and militia; also the camps at Columbus, N. M., and on the line of communication south as far as Colonia Dublan, Mexico, where I spent two days, and from where I have just returned.

"There is no doubt in my mind but that the condition of the troops in general is excellent. The sanitation of the camps at Columbus, N. M., Ojo Fredrico, and Colonia Dublan is far superior to anything that I have ever seen, and I think about as near perfect as is possible to attain. The health of the troops is consequently excellent, very little serious sickness, and plenty of available beds in the hospitals, except here at Fort Bliss, where the immense number of volunteer troops has certainly crowded Col. Straub a good deal. There is nowhere any lack of medical supplies or hospital necessities, and I don't think it necessary to ship any such things down here, nor, as I wrote Colonel Kean yesterday, can I see any possible use of civilian base hospitals of the Red Cross at the present time."

Massachusetts Ambulance Company No. 2. In last week's issue of the Journal we noted the organization of the Second Massachusetts Field Hospital. The Massachusetts Ambulance Company No. 2 has also been recruited to full strength to accompany this hospital and will also be mustered into Federal service. It consists of seventy-five non-commissioned officers and the following commissioned officers: Captain Oscar A. Dudley, Lieutenants James A. Lyon and N. M. Scott.

Work of Massachusetts Dental Unit.—Since the mobilization of the Massachusetts militia, a dental unit under command of Dr. Theodore E. Lafayette has been at work among the soldiers who camped at Framingham, from July 1 to July 21. On the latter date this unit completed its services and made the following report to the Surgeon-General.

"To the Surgeon-General: Please find enclosed the information which you requested. In behalf of the dental unit I desire to thank you and the Medical Corps for the kind treatment extended to us at the muster field. A great many improvements could be made in our dental clinic—such as the lighting, sterilization and water supply, but owing to the prevailing uncertainty of time at the camp we tried to make the most of what we had. The work at the field has been of very great interest to us and if we have done nothing more than aid a few to enter or continue in the service of the United States Army we shall have felt our time well spent. Army life is fascinating and it is with regret that we feel our stay is nearly over—but look forward with the fond hope that some day we may be in the service as dental surgeons.

"At any rate we are all proud to have served our country in a dental unit which we feel is the first of her kind in the history of the American army. Whether in the service or in private life we shall always stand ready and eager to serve America in whatever capacity she may call us.

"Thanking those who have so kindly given us the opportunity to be of some service to our country and for the kind treatment at the muster field, I beg to remain,

"For the Dental Unit,

"Sincerely yours,

"(Signed) Theodore E. LaFayette, D.M.D."

TO THE SURGEON-GENERAL.

"Days on Duty—Twenty (July 1-21).

"Seven operators constantly on duty (visiting): Dr. Theodore E. LaFayette, Jr., Mr. Harold W. Crowell, Dr. Stanley C. Keene, Dr. Angelo Luciabo, Dr. John Thomas, Dr. Roy Smith, Dr. Walter Kennedy.

"Chairs—Nine in good condition; one with broken legs.

"Gas Machine—One Teter machine (N_2OxO).

Patients examined	3126
Cleaning	900
Cement	521
Silver	675
Extractions	1273
Gas N_2OxO	219
Chloroform	2
Novocain	176
Treatments:	
Pericementitis (loose bridge-work)	11
Alveolar abscess	37
Antrum infection (x-ray taken, case cleared)	1
Plates (partial)	37
Mouth lesions noted:	
Lichen planus	2
Active pyorrhea	17

Material used:

48 bottles of white copper cement.
24 bottles of white silver alloy.
5 pounds of mercury.
24 tubes of cocaine.
50 "E" novocaine tablets.
1 gallon sterile water.
1 box temp. stopping.
1 box C matrix.
2 sets assorted burrs.
11 large tanks of N_2O.
7 small tanks of oxygen.
1 gallon of alcohol.
2 quarts liquor antiseptic.
50 corrosive sublimate tablets.
11 pounds pumice.
1 quart glycerin.
48 clean white coats.
15 bottles cleanoid solution.
7 rolls of rubber dam."

Massachusetts Relief Funds.—On July 29 the totals of the principal Massachusetts relief funds for soldiers on the Mexican frontier reached the following amounts:

Base Hospitals Fund	$77,747.20
Volunteer Aid Fund	73,021.44
Special Aid Fund	10,008.40
Home Relief Fund	2,193.00
Eighth Regiment Fund	1,985.00

BOSTON AND NEW ENGLAND.

The Week's Death Rate in Boston.—During the week ending July 29, 1916, there were 169 deaths reported, with a rate of 11.59 per 1000 population, as compared with 222 and a rate of 15.47 for the corresponding week of last year. There were 25 deaths under 1 year, as compared with 39 last year, and 38 deaths over 60 years of age, against 57 last year.

During the week the number of cases of principal reportable diseases were: diphtheria, 27; scarlet fever, 10; measles, 77; whooping cough, 31; typhoid fever, 6; tuberculosis, 54.

Included in the above were the following cases of non-residents: diphtheria 6; scarlet fever, 2; tuberculosis, 5.

Total deaths from these diseases were: diphtheria, 1; measles, 5; tuberculosis, 18; whooping cough, 1.

Included in the above were the following deaths of non-residents: diphtheria 1; measles, 1; tuberculosis, 18.

Typhoid Carriers.—The history of a family of typhoid carriers is told in the monthly bulletin of the Connecticut State Board of Health. The carriers in this instance were the immunized parents of children ill with typhoid. The two children, who lived on farms near Hartford, were taken sick with typhoid the first week in August.

"Each farm was sending milk to the city, so during the sickness the cows were boarded at another farm. In one case the infection of the milk had already been accomplished, and on this route sixty-one cases developed in the next four weeks. This figure shows at once how unpasteurized milk may be an unknown danger to its consumers.

"At the farms the members of the families were all immunized by the physician. The cases had an uneventful run, and by the end of August the children were apparently well. Before returning the cows to the farm it was deemed best to make sure that all the persons on the premises were free from infection. The parents, who took turns in nursing in both the families, the other two children and the children who had been sick were found all to be carriers, but three other adults in the families, less closely in touch with the patients were cleared. The two sick children cleared themselves of typhoid indications by the first of October, two months after the infection had been discovered, and the other two children were free shortly afterwards. But all four parents carried the disease germs till December, two months longer, although they had never had the fever.

"This observation shows a new way in which care must be exercised in dealing with typhoid, for there is danger of spreading the disease through the fact that immune attendants may become carriers."

Boston Baby Hygiene Association.—A recent report of the Boston Baby Hygiene Association states that during the past week 1891 infants were under care by the Association, being 200 more than during the corresponding week of last year. Of these babies, 605 attended the well baby conferences and 1286 were visited in their homes by the sixteen nurses maintained by the organization.

New Pathological Laboratory.—The July issue of the Bulletin of the Massachusetts State Board of Insanity reports that "on June 7 the State Board voted to establish, with the approval of the trustees of the Grafton State Hospital, a branch of the Pathological Service at the Summer Street department of the Grafton State Hospital, and there to make a new center for the investigation and treatment of brain syphilis.

"On the same date the Board voted to appoint Dr. Douglas A. Thom as assistant pathologist to the Board, to date from July 1, the Grafton State Hospital having kindly consented to provide for his maintenance and housing at the Worcester department. The major part of Dr. Thom's work will be in connection with the syphilis experimental treatments in special wards for male and female patients, as arranged for by Dr. May. The re-arrangement of the Summer Street building at Worcester will permit ample accommodations for the new branch of the Pathological Service, and includes an office for the assistant pathologist, space for the technician and room for the stenographer.

"This extension of the service will also relieve Dr. M. M. Canavan, who has been very much overworked by the development of the service. Dr. Thom will be able to undertake and investigate the work of accidents and sudden deaths for the middle and western parts of the State, namely, in six institutions.

"This plan of the State Board and the pathologist to establish a separate Psychopathic Department for the middle and western parts of the State has been made possible through the active and effective interest which Dr. James V. May and the trustees of the Grafton State Hospital have taken."

The Long Island Hospital, Boston.—The nineteenth annual report of the Boston Infirmary Department for the year ended January 31, 1916, states that the average population of the Hospital, 1014, shows an increase of fourteen over the previous year. In August the people housed at the Charlestown Almshouse were transferred to Long Island. Of the 112 persons who were in the institution at the time of removal, all but 13 men and three women have been received at the Long Island Hospital. The necessity for laboratory facilities at the Hospital is emphasized and suitable accommodations urged for the establishment of a laboratory where the abundant clinical material offered may be utilized. The opportunities at Long Island are exceptional for the thorough study of disease in many of its distressing forms, but without proper facilities, productive work cannot be accomplished.

Hospital Bequests and Gifts.—The will of the late Sarah E. Stickney, who died in Newburyport, Mass., on June 25, was filed on July 24 in the Essex County Probate Court at Salem, Mass. It contains bequests of $500 each to the Columbia Hospital, of Columbia, S. C., and to the Anna Jacques Hospital of Newburyport.

The recently filed will of the late Caroline M. Dana, who died on July 22, contains bequests of one-tenth of her estate each to the Industrial School for Crippled and Deformed Children, the New England Hospital for Women and Children, and the Children's Hospital, Boston.

Mr. Frederick Fanning Ayer, of Lowell, Mass., has recently made to the Lowell General Hospital an additional gift of $200,000, of which he requests that $130,000 be used to construct a new hospital building 200 feet in length and two stories high, to afford an operating room and living accommodation for twenty nurses. The income of the remaining $70,000 is to be used for the general purposes of the hospital. The Lowell Hospital at present accommodates 60 patients, but with the construction of further new buildings, for which the plans have been already drawn and approved, it will accommodate 160. The total of Mr. Ayer's gifts to the Hospital now amounts to $620,000.

The will of the late Alice G. H. Dwinell, of Brookline, Mass., which was recently filed at the Norfolk County Probate Court, contains bequests of $200 each to the Boston Lying-in Hospital and the Industrial School for Crippled and Deformed Children.

The will of the late Ellen Dunn of Salem, Mass., who died on July 12, was probated on July 25. It contains a bequest of $200 to the Carney Hospital.

Tuberculosis Survey.—It is announced that the National Association for the Study and Prevention of Tuberculosis purposes to expend $100,000 for an experimental three-year survey of tuberculosis in two selected towns of Massachusetts and New York. Among the towns under consideration are Canandaigua, Johnstown, and Patchogue, N. Y., and Framingham, Winchendon, and Norwood, Mass. In each town selected, every case of tuberculosis and every contact will be examined frequently and kept under constant observation. The purpose of the experiment, which will be in charge of Dr. Donald B. Armstrong of New York City, and Dr. Edward R. Baldwin, of Saranac Lake, N. Y., is to determine the absolute and relative values of various methods of combating the disease.

Miscellany.

NEW METHOD OF MAKING ANTI-HOG-CHOLERA SERUM.

A new method of preparing anti-hog-cholera serum, which permits the economical production of a clear sterilized product, has just been described in the *Journal of Agricultural Research* of the United States Department of Agriculture. The advantage claimed for the new method is that it makes possible the production of an anti-hog-cholera serum which can be quickly sterilized by heat to a point that will absolutely kill any germs of foot-and-mouth disease, and so yield a serum that is absolutely safe, even if taken from a hog which might harbor foot-and-mouth disease, and yet give no indication of being infected.

The method, as described by its discoverers, Dr. Marion Dorset and R. R. Henley, of the Biochemic Division, Bureau of Animal Industry, consists in adding a slight amount of an extract from ordinary white navy beans to the defibrinated hog-cholera-immune blood, which has been the form of the serum used in the past. The addition of this bean extract causes the red cells of the blood to agglutinate, and when the mixture is whirled on a centrifuge the red cells pack together and form a rather stiff jelly-like mass. It is then possible to pour off a clear serum, leaving behind the red cells, which play no part in preventing hog cholera, and which, in fact, simply tend to dilute the serum and render its sterilization by heat impracticable. To increase the yield of clear serum the discoverers added a small amount of ordinary salt and found that they obtained from 70 to 74% of clear serum. The clear serum thus obtained it was found could be heated for 30 minutes at a temperature of 60 degrees Centigrade without changing its consistency or lessening in any way its effectiveness in preventing hog cholera. The heating to this point for this time is more than sufficient to kill any germs of foot-and-mouth disease which might accidentally be present. Practical tests with hogs show that probably all of the antibodies useful in combating hog cholera were retained in the serum, and the red cells extracted contained so few, if any, of these valuable bodies as to make the residue of red cells useless in preventing the disease.

Before the clear serum was developed, many attempts were made to sterilize by heat in a practicable way the ordinary defibrinated blood. It was found, however, that heating the old product up to 60 degrees Centigrade resulted in more or less complete coagulation of the defibrinated blood and in the destruction of the serum so far as its commercial worth is concerned. It was found that the highest temperature that could be used was 50 degrees Centigrade, and it was necessary to keep the old serum at this temperature for 12 hours to make certain that the virus of foot-and-mouth disease was killed. Heating serum at a steady temperature over this long period in ordinary practice is difficult and too expensive.

Attempts also were made to make a clear serum by centrifugalizing. It was found, however, that while the centrifuge would separate to some extent the red cells, they were in such shape that it was difficult to separate the serum completely. An important quantity of antibodies was left behind in the red clot, and the resulting product was a cloudy rather than a clear serum. With this process, moreover, it was possible ordinarily to secure only about 50% of serum. Under the new method it is possible to secure as high as 74% of clear serum, which, in actual test, has proved to be fully potent. This clear serum, moreover, can be completely sterilized in 30 minutes, whereas the old serum had to be heated steadily for 12 hours.

The new form of serum, as far as the Department knows, is not yet being made or put on sale by the commercial serum laboratories. As this process was discovered by the Federal government, any one in the United States is free to use it.

UNITED STATES MEDICAL RESERVE CORPS.

At the examination recently held in various cities throughout the United States the following-named medical men successfully passed the examination for appointment as assistant surgeon in the Medical Reserve Corps, with a view to subsequent examination for appointment in the Medical Corps of the Navy:

James A. Halpin, M.D., Washington, D. C.
William D. Heaton, M.D., Wahoo, Neb.
Aubrey M. Larsen, M.D., Salt Lake City, Utah.
Lincoln Humphreys, M.D., Argenta, Arkansas.
Theo. Edward Cox, M.D., Cleveland, Ohio.
Arthur W. Hoaglund, M.D., Minneapolis, Minn.
Carroll H. Francis, M.D., Camden, N. J.
Harold L. Jenson, M.D., San Francisco, Cal.

SOCIETY NOTICE.

American Electro-Therapeutic Association.—The next annual meeting of the American Electro-Therapeutic Association will be held at the Hotel Martinique, New York City, September 12, 13 and 14, 1916.

APPOINTMENTS.

Rockefeller Institute.—The Board of Scientific Directors of the Rockefeller Institute for Medical Research announces the following promotions and appointments:

Dr. Alphonse R. Dochez, hitherto an associate in medicine, has been made an associate member.

Dr. Henry T. Chickering has been appointed resident physician in the hospital to succeed Dr. Dochez.

The following have been made associates:

Dr. Louise Pearce, pathology and bacteriology.

Dr. Frederick L. Gates, pathology and bacteriology.

The following have been made assistants:

Dr. Oswald Robertson, pathology and bacteriology.

Ernest Wildman, chemistry.

The following new appointments have been made:

Dr. Rhoda Erdmann, associate in the department of animal pathology.

Dr. Rufus A. Morrison, assistant in medicine and assistant resident physician.

Dr. John Northrup, assistant in the department of experimental biology.

Dr. Jean Oliver, assistant in the department of pathology and bacteriology.

Dr. Ernest W. Smillie, fellow in the department of animal pathology.

Dr. William D. Witherbee, assistant.

Hardolph Wasteneys, hitherto an associate in the department of experimental biology, has accepted an appointment as associate professor of pharmacology in the University of California.

RECENT DEATHS.

Dr. Edward Francis Hodges, who died recently at Cavendish, Vt., of heart disease, was born in Boston on Aug. 1, 1851. As a boy he attended the Boston Latin School, in the days of Dr. Francis Gardner, and under Dr. Soule. He graduated from Harvard with the class of '71, and then studied medicine in Washington. He received the degree of M.D. from Georgetown University in 1874 and from Harvard in 1877. In 1880 Dr. Hodges moved to Indianapolis, Ind., where he continued in the practice of his profession until he gave up active work, several years ago.

Dr. Hodges was a Fellow of the Massachusetts Medical Society from 1875 until 1888. He was professor of obstetrics in the Medical College of Indiana from 1884 to 1905, and professor of obstetrics in Indiana University from 1905 to 1912.

Dr. Hodges is survived by his widow, formerly Miss Laura Fletcher, and one son, Dr. Fletcher Hodges, a physician in Indianapolis.

Dr. Sir Victor A. H. Horsley, the celebrated British surgeon, died of heat stroke in Mesopotamia on July 16. He was born in 1857 and professionally was particularly noted for his work in cranial surgery. He was knighted in 1902, and since his retirement in 1906 had been emeritus professor of clinical surgery and consulting surgeon at the University College Hospital of London.

Dr. Charles R. E. Koch of Chicago, who died recently at Newton, Mass., was born in Polish Prussia in 1834 and migrated to the United States as a child. In 1860 he enlisted in an Illinois regiment with which he served throughout the Civil War. Later he studied dentistry and practised his profession in Chicago for many years. He was, for a time, secretary of the dental department of Northwestern University and had served as inspector-general and adjutant-general of the Illinois National Guard. During the Spanish War he organized and maintained a regiment at his own expense. He was a member of many dental organizations and was the author of a history of dentistry and of several works of military history. He is survived by his widow.

Sir William Ramsay, the celebrated British chemist, who died on July 23, at Beachcroft, Hazelmere, Bucks, England, was born in Glasgow on October 2, 1853. He became president of the British Association for the Advancement of Science and received the honor of knighthood in 1902. In 1904 he was awarded the Nobel prize in chemistry. He is chiefly noted for his researches on radium in 1907 and for his theory of the transmutation of elements announced in 1913.

Dr. Clarence A. Kirkpatrick of Philadelphia, a medical missionary at Namkham, in the Province of Burma, India, has died there recently. He was a graduate of the University of Pennsylvania.